RAILWAY MECHANICAL ENGINEER

Founded in 1832 as the American Rail-Road Journal

With which are also incorporated the National Car Builder, American Engineer and Railroad Journal, and Railway Master Mechanic. Name Registered, U. S. Patent Office.

See page 385

October, 1939

Volume 113 — *No. 10*

Published on the second day of each month by

Simmons-Boardman Publishing Corporation

1309 Noble street, Philadelphia, Pa. Editorial and Executive Offices: 30 Church street, New York, and 105 West Adams street, Chicago. Branch offices: Terminal Tower, Cleveland; 1081 National Press bldg., Washington, D. C.; 1038 Henry bldg., Seattle, Wash.; Room 1001, 485 California street, San Francisco, Calif.; 530 W. Sixth street, Los Angeles, Calif.

SAMUEL O. DUNN, *Chairman of Board, Chicago;* HENRY LEE, *President, New York;* LUCIUS B. SHERMAN, *Vice-Pres., Chicago;* ROY V. WRIGHT, *Vice-Pres. and Sec., New York;* FREDERICK H. THOMPSON, *Vice-Pres., Cleveland;* ELMER T. HOWSON, *Vice-Pres., Chicago;* FREDERICK C. KOCH, *Vice-Pres., New York;* ROBERT E. THAYER, *Vice-Pres., New York;* H. A. MORRISON, *Vice-Pres., Chicago;* JOHN T. DEMOTT, *Treas. and Asst. Sec., New York.*

Roy V. Wright
Editor, New York

C. B. Peck
Managing Editor, New York

E. L. Woodward
Western Editor, Chicago

H. C. Wilcox
Associate Editor, New York

C. L. Combes
Associate Editor, New York

Robert E. Thayer
Vice-Pres. and Business Manager, New York

Subscriptions (including, when published, the daily editions of the Railway Age, published in connection with the convention of the Association of American Railroads, Mechanical Division), payable in advance and postage free, United States, U. S. possessions and Canada: 1 year, $3; 2 years, $5. Foreign countries, not including daily editions of the Railway Age: 1 year, $4; 2 years, $7. Single copies, 35 cents. Address H. E. McCandless, circulation manager, 30 Church street, New York.

The Railway Mechanical Engineer is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.), and is indexed by the Industrial Arts Index and also by the Engineering Index Service.

Locomotive:

High Performance with Diesel-Hydraulic Locomotive .. 385

Car:

Trends in Passenger-Car-Truck Design 387

General:

New Association to Deal with Locomotive Maintenance 390
What Is the Car Officers' Association?..... 391
Locomotive Operation Completely Covered by Fuel and Traveling Engineers 392
The Boiler Makers' Association 393
Trends in the Development of Machine Tools 394
Power Reverse Gear Operating Valve 396
T-Z Brake Hanger Wear Blocks 396

Editorials:

Is the Repair Shop Equal to the Job? 397
Training of Supervision 397
Riding Qualities of Passenger-Car Trucks 398
Economies from Streamlining 398
What Carmen Are Thinking About 399
The Laboratory and Service Performance 399

Backshop and Enginehouse:

Shop Lifting Devices—Factor of Safety 400
Some Gadgets Work (A Walt Wyre Story) 402
Unusual Boiler Patch on Argentine Locomotives 406
Locomotive Boiler Questions and Answers 406

Car Foremen and Inspectors:

U. P. Builds Lightweight Box Cars 407
Building Up the Car Inspector 410

New Shop Tools and Equipment:

Vertical Turret Lathe 414
Contour Grinder for Tread-Turning Tools 415
Single-Operator Electric Arc Welder 415
Steam Guns for Cleaning Work 415
Heavy-Duty Lathes Have Speed Selector 416
High- and Low-Velocity Unit Heaters 416
Lift-Platform Industrial Truck 416
Pipe Machine with New Die-Head Design 417
Hydraulic Automatic Lathe 417
Face Grinder with Centralized Control 417
Oil Burner Maintains Correct Air-Oil Ratio 418
Tractor Crane and Auxiliary Equipment 418
Air-Acetylene Soldering Iron 419
Portable Electric Hammer 419
Universal Shaper for the Toolroom 419
Semi-Automatic Threading Machine 419
All-Steel Shear with Power Back Gage 420
Machine Combines Milling and Shaving 420
Lathe Powered with All-Electric Drive 420
Roll-Threading Machine Has Revolving Die Head 421
Bronze Welding Rod Is Coated with Flux 421
Iron Worker Performs Several Operations 421
Grinder with Built-in Electrical Controls 422
Vertical Shaper with Hydraulic Ram Drive 422
Horizontal Boring Machine 423
Face Grinder with Hydraulic Table Drive 423
Built-in Revolving Table Top Machine 424
Two-Screw Drop-Pit Table 424
Wrench Indicates Applied Torque 424
Turret for Brass Work 425
Rapid Traverse for Lathe Cross Slide 425
Continuous-Feed Facing Head 425

High Spots in Railway Affairs..... 426

News..... 427

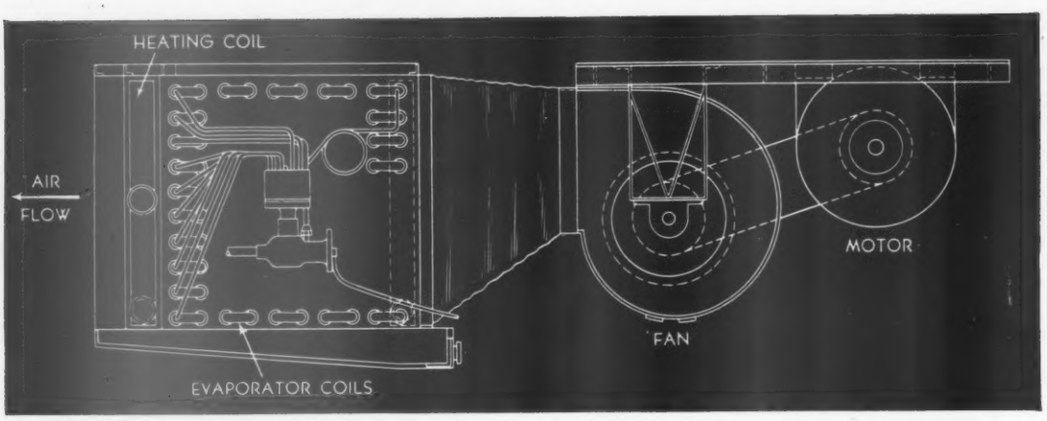
Index to Advertisers .....(Adv. Sec.) 50

For 5 New Pennsylvania Railroad Diners

BUILT BY AMERICAN CAR & FOUNDRY COMPANY

☆

Sturtevant Fan and Coil Assemblies For Air Conditioning Systems



Side elevation of Sturtevant Fan and Coil Assembly used in connection with General Electric Air Conditioning Systems in five new P.R.R. Diners built by American Car & Foundry Company.

FOR the five new Pennsylvania Railroad Diners, recently built by American Car & Foundry Company—and embodying an entirely new level of luxury, beauty, and comfort—Sturtevant Air Conditioning Equipment was selected for low-side service. As illustrated, this equipment in each car consists of a complete fan and coil assembly, including main distributing fans with motor drive, direct expansion evaporator coils (Freon), and heating coils.

These Sturtevant Fan and Coil Assemblies were specially designed to very exacting Pennsylvania Railroad specifications—and to fit very limited space conditions.

Also selected for installation in these diners were Sturtevant Kitchen Exhaust Fans.

Sturtevant Air Conditioning Equipment For Every Purpose

Including equipment ranging from complete air conditioning systems (ice or electro-mechanical compressor) to individual units of equipment such as fans, evaporators, condensers, heating surface, etc.

B. F. STURTEVANT CO., Hyde Park, Boston, Mass.
Branches in 40 Principal Cities
B. F. Sturtevant Company of Canada, Ltd.—Galt, Toronto, Montreal

Sturtevant RAIL VANE TRADE MARK UNITS OR SYSTEMS

Sturtevant "Railvane" Units or Systems are used by 37 railroads. "Railvane" Air Conditioning is protected by 40 issued patents and other patents pending.

FOR 29 YEARS . . . PIONEERS IN AIR CONDITIONING

The Plymouth-Hamilton hydraulic-drive Diesel switching locomotive

High Performance With

Diesel-Hydraulic Locomotive

The 70-ton locomotive starts, accelerates, stops, holds and restarts a 300-ton load on a 5 per cent grade through hydraulic torque converter which permits full engine horsepower to be utilized at all speeds

A DIESEL engine made by the Hoovens, Owens, Rentschler division of the General Machinery Corporation and a hydraulic torque converter type of transmission for railway motive power use, developed by the Hydro Transmission Corporation, Hamilton, Ohio, are being demonstrated in a 70-ton six-wheel switching locomotive built by the Plymouth Locomotive Works, Plymouth, Ohio. The locomotive, an outline of which is shown in the drawing, has essentially the standard chassis of the builder. It has a wheelbase of 8 ft. 8 in. and a length over the couplers of 27 ft. 6 in.

The Engine

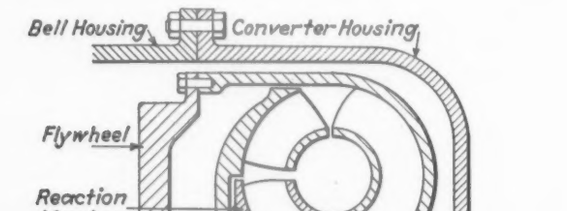
The six-cylinder Hamilton-M. A. N. Diesel engine has cylinders 8¾ in. by 12 in. and is rated at 400 brake horsepower at a crankshaft speed of 900 r.p.m. It is the four-cycle type, single-acting, with a solid-injection system and has two exhaust and two intake valves.

The cylinder block, cast in one piece, and the individual cylinder heads are of Meehanite iron. The cylinder liners of special cast iron are set in the cylinders and the cooling water circulates in the space between the liners and the cylinders. The cylinder heads are made in one piece with division walls and ribs to assure effective cooling. The cylinder head is bolted to the cylinder jacket by a number of studs of special steel. The joint between the cylinder and the cylinder head is dry.

In each of the cylinder heads is placed one fuel valve, one relief valve, two air-inlet valves, and two exhaust valves. The fuel is delivered to the injection valves by individual Bosch pumps operated from the main camshaft. The amount of fuel injected into the cylinder is controlled by the injection pump which is regulated by the governor. The fuel-valve nozzle injects the fuel into a water-cooled pre-combustion chamber and the injection pressure is determined by a spring-loaded valve in the fuel valve. The relief valves are set to protect the cylinders against excessive pressures. The air inlet and

exhaust valves are operated through push rods by the camshaft and are of a size to permit proper scavenging and charging of the cylinder with clean air.

The cast-alloy crankshaft has 7½-in. journals and 6¼-in. crankpins. The shaft is machined to a close tolerance to keep the bearings at right angles to the line of the piston at any point of the stroke. The crankshaft is drilled for the distribution of oil to the crankpin bearings. It is held in a longitudinal direction by one thrust bearing. The main bearings are of the precision type and require no fitting.



Schematic cross section of the Schneider hydraulic torque converter

The two-piece connecting rod is made of an open-hearth steel forging. The upper end of the rod is fitted with bronze bushings to carry the piston pin and the rod is drilled through the center for the pressure lubrication of these pins. The heat-treated, aluminum-alloy piston is fitted with five power rings and three scraper rings. The floating piston pin is carried in the cross bore of the piston which is plugged to keep lubricating oil from the pin off the cylinder walls.

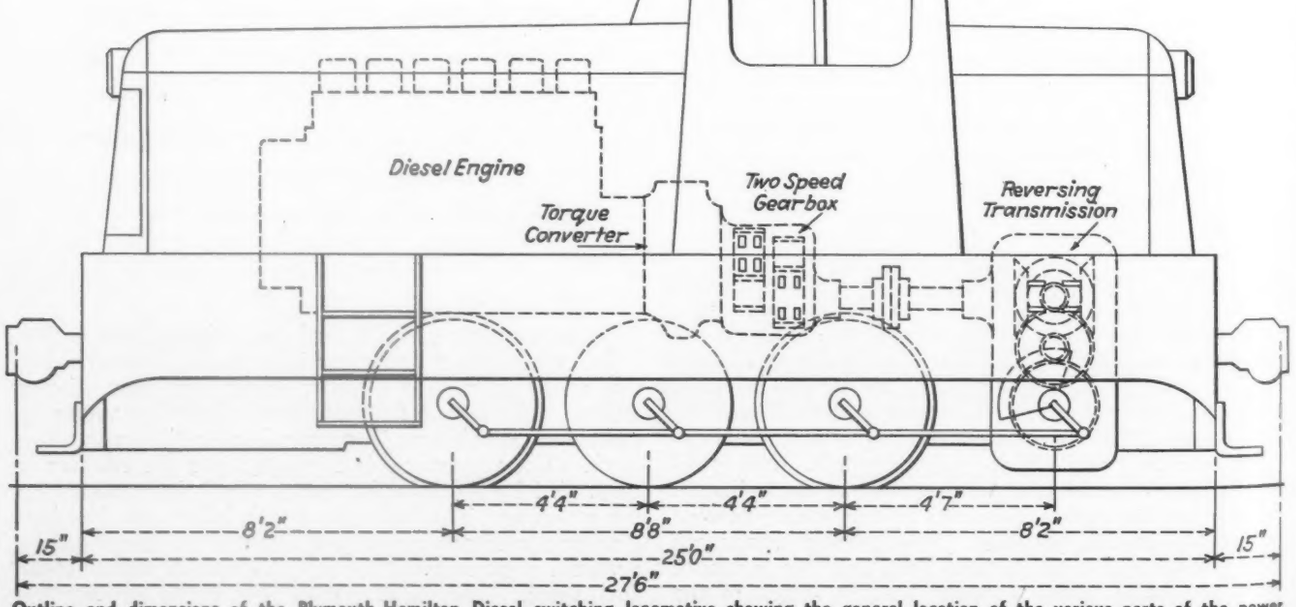
A centrifugal variable-speed governor is driven by bevel gears from the camshaft. The governor acts through linkage on the injection pumps and is controlled by the throttle. An over-speed device acts independently on the fuel-pump control rods and shuts off the fuel when the maximum speed is exceeded. The governor has an attachment which reduces the engine speed to idling upon the failure of the lubrication oil or the cooling water. A cooling system, comprising a fan, radiator, oil coolers and pumps, is furnished for the cooling of the water, lubrication oil, and torque-converter oil.

The Hydraulic Torque Converter

The Schneider hydraulic torque converter, a schematic cross section of which is shown in one of the drawings, consists essentially of three parts: (1) the centrifugal pump impeller attached to and driven by the Diesel engine flywheel; (2) the turbine attached to the drive shaft of the locomotive and, (3) the torque-increase feature, i.e., reaction vanes, which do not rotate and are attached to the converter housing. The housing of the converter is bolted to the engine housing. There is about ⅛-in. clearance between the rotating and stationary parts. The rotating parts are mounted on ball bearings and are lubricated by the converter oil. The power transmission through the converter varies with the engine speed and depends on the velocity of the oil through the various bladings in the converter.

The oil for the converter and the gearbox is carried in a tank located directly beneath them. The oil is pumped from the tank through a filter to the converter by a pump which is driven by V-belts from the forward

(*Continued on page 395*)



Outline and dimensions of the Plymouth-Hamilton Diesel switching locomotive showing the general location of the various parts of the power plant and the transmission

Trends in

Passenger-Car-Truck Design

A study of European and American data indicates the fundamental principle underlying good riding qualities

By A. Giesl-Gieslingen*

THE importance of providing better riding qualities for passenger and freight cars is generally recognized, today. In a recent article[1] K. F. Nystrom expressed the belief that providing a truck with satisfactory riding qualities without, at the same time, running into excessive weight, is probably the most important engineering problem confronting railroads and car builders. Since the problem has found the same intense attention in European countries as in the United States, a review of present trends and recent experiences is justified even though there are indications that the whole matter is still very much in evolution.

Let us first consider certain basic influences: a primary question is whether a short or a long wheel base should be favored and what the contour of the wheels should be. We have recently learned that these two questions are closely related under certain conditions, and the contradicting experiences made in this respect by various investigators can now be regarded as fully explainable.

A few years ago, it had been found by the Chicago, North Shore & Milwaukee[2] as well as by the German State Railways that wheel treads being cylindrical or having a smaller taper than the usual 1 in 20 largely eliminated the rapid nosing movement of the trucks which resulted in often quite violent lateral oscillation of the car bodies at higher speeds; the improvement, which H. A. Otis demonstrated by a moving picture before the A. S. M. E. was striking and wheel treads with a taper of 1 in 40 found wide adoption. However, in order to retain the advantages thus gained in running qualities, treads had to be re-machined at shorter intervals than hitherto because, as wear developed in service in the form of a groove, a steeper taper reappeared on the flange side of the wheel and the nosing movements increased again in frequency and intensity. Thus, running qualities were a function of distance run since the last tire turning and the German State Railways, for instance, specified tire turnings for high-speed vehicles at intervals of approximately 30,000 miles which is quite unsatisfactory from an operating and cost standpoint. Simultaneously, a longer wheelbase was favored for four-wheel trucks because, with a given wheel taper, it reduced the frequency of the nosing movements. A 9-ft. wheelbase was adopted on recent Zephyr trains, while 10 and 12 ft. became standard on various European railroads.

However, the conclusions above outlined were completely upset when the further research work of the German State Railways showed that strict elimination of all play between the axle boxes and their guides in the truck frame, combined with strictly parallel position of the two axles in the truck, eliminated any tendency of nosing even with steep tire tapers and worn wheels. This immediately explains why certain investigators who happened to use trucks with a rigid cast-steel frame, accurately machined to close tolerances, found, as Mr. Nystrom did, that there was no improvement with nearly cylindrical wheel treads and no deterioration with worn wheels.

This result is of greatest importance for future car construction; among other things, instead of favoring trucks with a long wheelbase and with accordingly greater weight, we can limit ourselves to a wheelbase sufficiently long to prevent excessive tilting of the frame under the action of the brake forces. But the only way to make such a truck permanently satisfactory is to eliminate the conventional journal-box guides which are subject to rapid wear, and to replace them by means permanently securing the required perfect alignment of the truck axles. This will be discussed below later.

The second basic question is: How should the spring arrangement be chosen in order to reduce to a minimum the influences of track unevenness upon the motion of the car body. Development began with a single set of springs introduced somewhere between the journal box and the car body as in the standard U. S. freight-car truck and in the older type of European four-wheel car.

Attempts to improve the spring action have almost universally led to the introduction of a second set of springs in series and for higher requirements it has been found best to combine friction springs (such as elliptic or semi-elliptic) and frictionless coil springs. The prac-

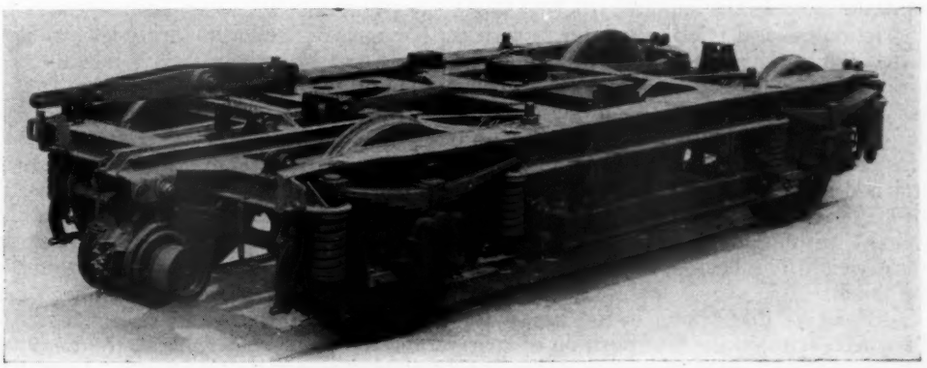


Fig. 1—Passenger-car truck with quadruple spring suspension

* Assistant sales manager, Wiener Lokomotivfabrik A. G., Vienna.

[1] Designing New Passenger Cars by K. F. Nystrom, *Railway Age*, May 20, 1939, p. 862.

[2] North Shore Reduces Truck Nosing, by H. A. Otis, *Railway Age* for Sept. 7, 1935, p. 301.

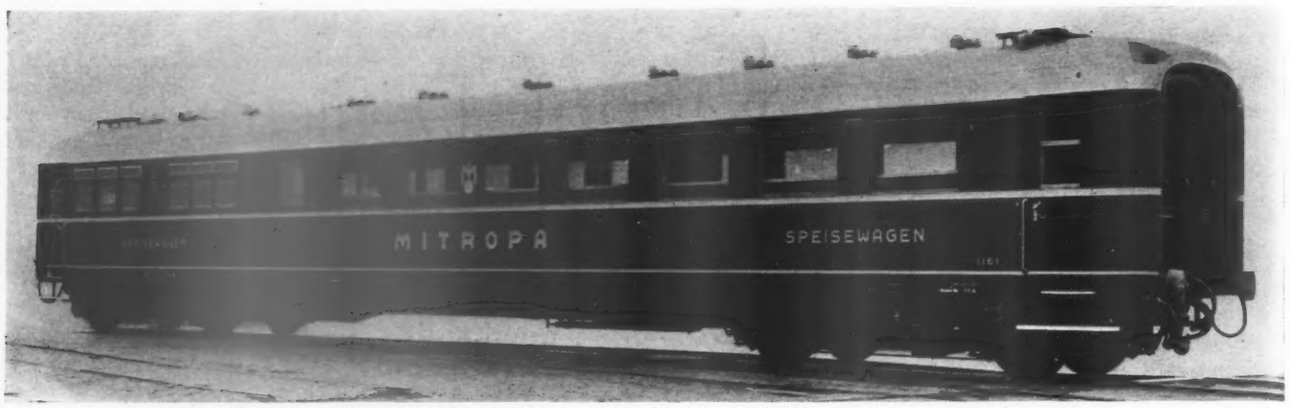


Fig. 2—A Mitropa dining car built in 1939. Length over buffers, 77 ft. 1¼ in.; weight in service order, 118,000 lb.

tical effect is that the coil springs respond to the slightest impact while the friction springs come into action with stronger impacts and simultaneously dampen the oscillations of the car body by virtue of their energy-consuming qualities. This system is used in the standard U. S. passenger truck as well as in most other countries.

To fulfill still more exacting requirements there has been a distinct tendency to arrange a still greater number of spring groups in series; thus the Pullman-Union Pacific truck uses triple spring suspension in combination with a double bolster. Triple suspension is also shown on Mr. Nystrom's experimental trucks and became standard in several European countries a good many years ago.

But the tendency of still further augmenting the number of springs has not stopped at the triple suspension. In England as well as in Germany, quadruple suspension has appeared and has been adopted as standard to a considerable extent. The truck shown in Fig. 1 gives an example of quadruple suspension wherein a combination of semi-elliptic and coil springs is interposed between journal boxes and truck frame as well as between truck frame and the bolster which carries the car body. The latest designs, as used under the 1939 Mitropa dining cars differ from the first merely by the introduction of softer coil springs for the bolster, characterized by the large diameter of 12 in. which is about double the diameter shown in Fig. 1.

The triple suspension, if well designed, has already given some remarkably good results, examples of which are given in Figs. 3 and 4 showing, respectively, horizontal and vertical motions of a car body at the vestibule end, on the City of Denver at 83 miles an hour and on a German Diesel train between Berlin and Leipzic at 99 miles an hour. In both cases, the track was in distinctly good shape; one might say, as good as it can ever be maintained under regular service conditions.

While the quadruple suspension can be made still less sensitive to track conditions, the question naturally arises whether there is any basic reason which would make a multiple suspension superior to the single combination of frictionless and friction springs in series. The answer is that the relatively heavy truck frame with all its accessories which we have interposed between wheels and car body and which in itself is nothing but an evil, furnishes the only justification for the use of multiple spring suspension. In recent lightweight cars the truck frame and attached parts weighed about 25 per cent of the car body load carried by the truck and this percentage has increased with modern light-weight construction because more weight has been saved in the car structure than in the truck.

As long as this frame is too heavy to be carried by the wheels without the interposition of considerable spring resiliency, the car body, in combination with the truck frame, forms a vibration system diagramatically shown in Fig. 5. Such a system has two frequencies at which resonance will occur, the impulses coming primarily from the rail joints. A numerical example was given by Karl Arnstein in his description of the Comet train in Mechanical Engineering for September, 1935, p. 556.

A study will show that we get very unpleasant resonance at high speeds if we provide a heavy truck frame with soft axle-box springs and that a danger of such high-speed resonance is minimized with harder axle-box springs and eliminated if we manage to provide a light truck frame supported upon the wheel with as little spring resiliency as possible. In fact, as far as the motion of the car body is concerned, the most favorable arrangement would be one that puts all the permissible spring resiliency between truck frame and the car body. This would also eliminate the several additional occasions for resonance which arise with the tilting and rolling motions of the truck frame.

One of the most practical steps toward improving the riding qualities of railroad cars is therefore the radical weight reduction of truck frame and attached parts. The realization that we may use a short wheel base under the conditions outlined above is an essential help in this direction.

The third basic question is: Should elliptic or semi-elliptic springs be retained or should they rather be replaced by coil springs combined with suitable damping devices. The combination of friction and coil springs has done very good service but the elliptic spring requires much space and, as a simple calculation will show, becomes much heavier for a given amount of energy absorption than the coil spring; from elementary spring formulae, the active volume of a coil spring is obtained as

$$V_c = W \frac{2G}{T^2}$$

wherein W is the total spring load times the deflection, G the modulus of rigidity, and T the maximum torsional stress without correction for spring curvature. For an elliptic spring or its equivalent stressed in bending, we obtain

$$V_e = W \frac{6E}{B^2}$$

wherein E the modulus of elasticity and B the maximum bending stress. Thus, the volume or weight of a coil spring compares with that of an elliptic spring of same strength and resiliency, as follow:

$$V_c = V_e \frac{1}{7.6}\left(\frac{B}{T}\right)^2$$

In general, the nominal torsional stress may be chosen

at least 60 per cent of the bending stress, so that the coil spring will weigh less than 40 per cent of the equivalent elliptic or semi-elliptic spring. In a well-sprung light-weight car, the substitution of coil springs may easily save more than 2,000 lb. and something additional because the entire design may be made more compact. Considering how important it is to reduce the dead weight of trucks, it requires no particular vision to see that the friction spring is bound to disappear from high-class passenger equipment and that we are going to introduce some sort of torsion springs with hydraulic damping.

Recent examples of high-speed passenger-truck construction show already at least partial realization of the above outlined principles. The French, for instance, have built, in 1937, an experimental passenger car with trucks working upon the principle of the American freight-car truck, and having such light frames of pressed and welded sheet metal that the introduction of springs between the truck frame and the wheels was

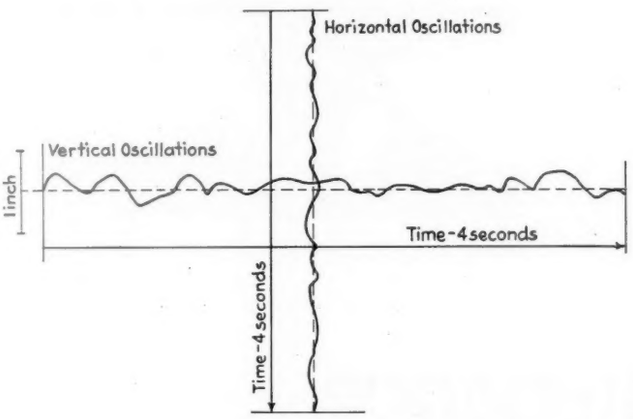


Fig. 3—Oscillating diagram of the City of Denver at 83 m.p.h. taken in the front vestibule of the first coach (non articulated)

considered unnecessary so that all the spring resiliency could be put between the frame and the car body.[3] The wheel base is only 8 ft. 2½ in. But in order to be unobjectionable, such a short wheel base should be combined with a rigid frame, which the American freight-car frame is not.

The German State Railways, which for seven years past had fully supported the older theory, favoring long wheel-base trucks up to 12 ft. together with very long soft semi-elliptic springs and triple and quadruple suspension, have now gone farthest in the introduction of the more advanced theories and the German standard truck which is going to be used for all passenger cars scheduled to be built in 1940 will have the following outstanding characteristics: The wheel base will be reduced to 7 ft. 0⅝ in.; swinging levers arranged parallel to the rails and attached to the roller-bearing journal boxes at one end and to the truck frame at the other, are going to secure perfect alignment of the axles. The journal-box guides merely act laterally. Tests have shown that this arrangement makes it possible to increase the running distance between tire turnings by 150 per cent namely, to 78,000 miles with no detrimental effect upon running qualities.

While the elliptic journal-box springs, arranged in series with coil springs are retained for the time being, the bolster is carried upon coil springs with hydraulic damping. The weight of the truck, without wheel sets and axle boxes, is only 3,950 lb., 42 per cent less than the lightest truck of earlier construction with a 10-ft. wheel base.

The new German streamlined passenger cars to be put into service from 1940 on will weigh only 62,000 lb. and will be 29 per cent lighter than those built in recent years. But the relative reduction in truck weight has been even greater and the truck frame including attached parts, weighs merely 16 per cent of the car body, thus going a

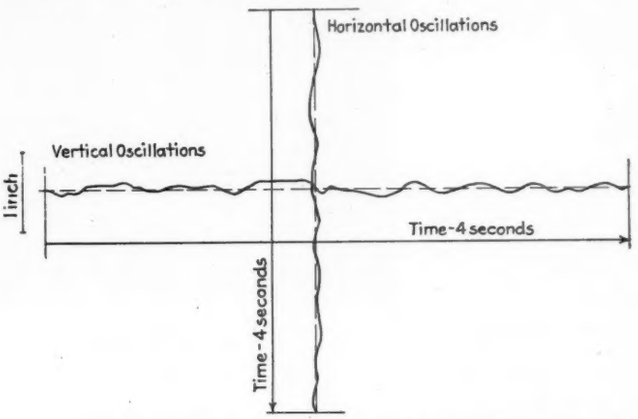


Fig. 4—Oscillating diagram of the Berlin-Leipsic four-car Diesel-electric train at 99 m.p.h. taken over the leading truck

long way toward realization of ideal conditions. These cars are to be about 77 ft. long between buffers, and are designed for a buffing load of 440,000 lb.

Further tests are being made in Germany with trucks which completely eliminate the conventional forms of springs and replace them by torsion rods in accordance with principles familiar to automobile and airplane designers. Another test is being made with conical wheel discs which permit reduction of bearing centers so that the truck width is sufficiently reduced to permit a streamlined enclosure to run unbroken from one end of the car to the other. Finally, an attempt is being made to do away with journal-box guides altogether, which can be

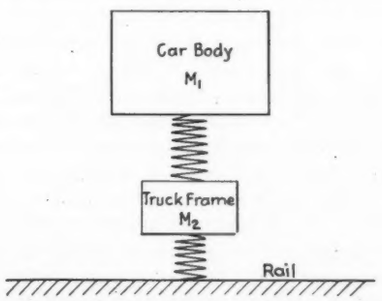


Fig. 5—Vibrating system of a standard passenger car

done by a suitable construction of the swinging levers used in the trucks of the 1940 model of the German State Railways to take care of the lateral forces, further approaching automotive practice.

In all these developments, the outboard journal has been retained, although the inboard type would permit further savings in frame weight. As long as journal-box springs of considerable resiliency are used, they have to be placed outside of the wheels in order to prevent excessive car-body roll. But, if none or but little springing is required between the axle and truck frame, the inboard arrangement is decidedly worthy of consideration if provision is made for sufficiently wide spacing of spring supports for the car body. This has already been done in the "Flying Silver Fish" which recently reached a speed of 145 miles an hour between Berlin and Hamburg.

[3] See Revue Générale de Chemins de Fer, February, 1937, p. 4.

F. B. Downey, President

Program is broad enough to interest administrators and supervisors in back shop and enginehouse, tool specialists, apprentice supervisors, and chief locomotive inspectors

New Association to Deal with

Locomotive Maintenance

THE program of the Locomotive Maintenance Officers' Association (International Railway General Foreman's Association) for this year's meeting, to be held at the Hotel Sherman, Chicago, October 17, 18, and 19, is concrete evidence of the work that has been done by its officers and members to direct the activities of the association toward future objectives which will broaden its usefulness, at the same time limiting its field to the problems involved in locomotive maintenance. From the time of the organization of the original General Foremen's Association until the depression, when its activities were of necessity temporarily suspended, the program of the association was so shaped as to interest supervisors of car repairs as well as those responsible for locomotive work in the backshop and the engine terminal. It became increasingly evident as time went on that the problems of the car department were more or less unrelated to those encountered in locomotive maintenance. As now organized, the Car Department Officers' Association serves the car-department administrator and supervisor as well as the interchange inspector.

Recognition of this fact has undoubtedly been a major factor in the decision of the present Locomotive Maintenance Officers' Association to limit the field of the new association to the problems involved in the maintenance of locomotives, both in the backshop and engine-house. The Fuel and Traveling Engineers' Association deals effectively with locomotive operation, but there is no other organization which is prepared to consider the problems of shop and enginehouse management or the multitude of questions pertaining to maintenance standards and the methods and practices of servicing and repairing locomotives.

The new association has received many definite assurances that the decision of its executive committee to broaden the scope of its work in this specific field will meet with the whole-hearted support of progressive mechanical officers. The progams of this year's meeting is broad enough to interest shop engineers, shop superintendents, enginehouse foremen, chief locomotive inspectors, supervisors of shop machinery and tools, apprentice supervisors, mechanical engineers, and their assistants. Because this year's meeting is one of unusual importance in the formation of association policies and the opportunity to establish the ground work of the association's activities for years to come, there should be a large attendance. The officers of the association have already envisioned the possibilities for definite and valuable committee work on subjects involved in shop and enginehouse operation which as yet have had no part or treatment in the program of other associations.

In considering the potential usefulness of this association, it may be well to keep in mind that more money is spent in the railroad industry for locomotive repairs than is spent for any other single item of operating expense. Whether or not this money will be spent wisely in the future will depend upon the intelligence and the breadth of knowledge of those who are responsible for spending it. The Locomotive Maintenance Officers' Association, as it is now being reorganized, will be one of the few effective agencies available for broadening the knowledge and sharpening the intelligence of these men.

What Is the

Car Officers' Association?

C. J. Nelson, President

Organized as a form for arriving at uniformity of interpretation of interchange rules, it has gradually broadened to present organization for the study of problems of car maintenance and operation

WHAT is the Car Department Officers' Association? What are its objectives? Does it merit general support? These are pertinent questions which deserve thoughtful answers.

The association was originally organized in 1901 under the name Chief Interchange Car Inspectors' and Car Foremen's Association, its activities being broadened in scope in 1926 and the name changed to Railway Car Department Officers' Association. In 1928, it united with the Southwest Master Car Builders' and Supervisors' Association and adopted this name except for the elimination of the word "Southwest." In accordance with the wishes of the A. A. R. Mechanical Division, the name of the association was again changed in 1930 to Car Department Officers' Association, a name which has been retained since that time.

Quoting the constitution: "The objects of this association shall be to bring together supervisors interested in car department matters, for the advancement of knowledge pertaining to safe and economical operation, and to exchange ideas, discuss problems, promote uniformity, effect economies in car construction, maintenance and operation; also to make constructive recommendations to the Association of American Railroads."

In considering how much general support this group of car supervisors merits, it should be remembered that Class I railroads spend annually somewhere in the neighborhood of $275,000,000 on car repairs. The efficiency with which this work is done and the money expended is dependent in the last analysis upon the competency and morale of car supervisors from department heads down. These men must be familiar with the best practices not only on their own, but on other roads, and it is difficult to see how they can acquire this familiarity if individual foremen and supervisors are held so tightly to their respective jobs that they seldom get an opportunity to visit other car repair points or attend gatherings of car men.

Unquestionably, therefore, it is very much in the interests of each railroad to send as many leading car men as practicable to the annual meetings of the Car Department Officers' Association. Constructive programs are provided. The relatively small expense entailed is insignificant when compared with the amount which may be saved as a result of giving car men an opportunity to get together once a year, compare notes, discuss mutual problems and disseminate information regarding the latest practices in car departments.

The possibilities and potential importance of the Car Department Officers' Association are emphasized in an editorial published on page 452 of the November, 1938, *Railway Mechanical Engineer,* which says in effect that, with the proper leadership and direction, the association may be developed not only to improve the knowledge, acquaintance and morale of car department supervisors but serve as a valuable adjunct to the A. A. R. Mechanical Division, in no way overlapping or duplicating the work of this important organization.

Apparently mechanical-department heads can take hardly a more constructive single action in the interests of increased economies in the car department and hence better railroading than to support whole-heartedly the Car Department Officers' Association. This means primarily to recognize the soundness of its objectives and help the attainment of these objectives by sending as many supervisors as practicable to the annual meetings.

Locomotive Operation Completely Covered by

Fuel and Traveling Engineers

J. R. Jackson, President

With the October meeting this association begins its third year as the amalgamation of the two strongest of the voluntary mechanical organizations—The association provides a single forum for the problems of locomotive service

THE Railway Fuel and Traveling Engineers' Association, as now organized, is a happy combination of two important groups of railroad men—namely fuel supervisors and representatives of locomotive service, primarily traveling engineers. The association membership also includes representatives of companies engaged in the production of fuel, either coal or oil, fuel-handling devices, locomotive fuel-saving accessories or anything which contributes to fuel economy and improved locomotive operation.

The organization of fuel men, formerly known as the International Railway Fuel Association, held its first annual meeting in Chicago in 1908 and was designed to concentrate the attention of railway officers on all phases of the problem of effecting economies in fuel consumption which, at that time, were particularly feasible and desirable. The association grew rapidly in size and importance and at one time had a membership of over 1,200. It adopted an aggressive and constructive policy of education in fuel saving methods which has been credited with much of the success of the railroads in reducing unit fuel consumption and cost figures.

In the ten-year period from 1920 to 1930, for example, the unit fuel consumption in pounds of coal per 1,000 gross ton-miles, not including the weight of the locomotive and tender, was reduced from 197 lb. to 138 lb., or 30 per cent. Similarly in passenger service, the pounds of coal per passenger train car mile dropped from 18.8 lb. to 14.7 lb. or 22 per cent. One reason for the effectiveness of this association of fuel men was the fact that it offered a common meeting ground for both railway and fuel supply company representatives, with the result that improved practices in the inspection and preparation of fuel were developed and generally applied.

In 1936, as the result of a demand for greater economy and less overlapping in the work of various railway associations, the International Railway Fuel Association was consolidated with the Traveling Engineers' Association under the name "Railway Fuel and Traveling Engineers' Association." The original T. E. A. was organized in 1893 and held 38 annual conventions up to and including the last meeting in Chicago, September, 1930. This association had a remarkable record of usefulness and at one time boasted a membership of over 1,600. It was devoted to all phases of improvement in locomotive service including fuel economy, however, and hence overlapped the work of the International Railway Fuel Association to a certain extent. The union of these two associations, therefore, in a single aggressive group was obviously in order and very much in the interests of the railroads as well as the two associations.

The Railway Fuel and Traveling Engineers' Association is now holding its third annual meeting this month at the Hotel Sherman, Chicago. A high point in the program this year, which will be enjoyed jointly by the members of the four associations meeting at the same time this year, is the opening address on training supervisors by L. W. Baldwin, president, Missouri Pacific. Air brake subjects will be presented on the afternoon of the first day, also possible fuel economies in power-plant operation. On the second day, devoted to mechanical design features, the following general subjects will be considered: New locomotive economy devices, maintenance, steam turbine locomotives, utilization of locomotives and firing practice. The third day, designated fuel day, is allotted for the consideration of such subjects as fuel wastes and losses, fuel records and statistics, preparation of washed and dried coals, etc.

This well-balanced program is typical of the Railway Fuel and Traveling Engineers' Association. It is typical of the comprehensive, well-edited and instructive year book put out by the association. It is typical of the service which this association endeavors with notable success to perform for individual members and, through them, to the railroads they represent.

The Boiler Makers' Association

W. N. Moore, President

An organization of demonstrated independence and resources continues to keep in vital touch with the problems of boiler maintenance and boiler-shop operation

THROUGHOUT its history the Master Boiler Makers' Association has enjoyed the respect and confidence of the managements of American railways to a high degree. Its programs have always been intensely practical and have wielded a wide influence in hastening the spread of knowledge concerning all developments affecting boiler-shop practice and boiler maintenance, as well as in crystallizing the formation of sound opinion in its committee reports and symposia on details of practice. It is not one of the largest mechanical-department associations, but the quality of its proceedings has built up a strong interest in the work of the association throughout its particular field of activity.

Two master boiler makers' associations of similar purpose but differing in the field covered were organized in 1902. These were the International Railway Master Boiler Makers' Association and the Master Steam Boiler Makers' Association. They came together by amalgamation in 1907 and reached a peak in membership of 631 in 1919 during the period of federal operation of railways in the United States. The work of the association continued successfully throughout the prosperous years following, but it was the depression which brought out the particular quality of independence possessed by this organization.

During the depression the Master Boiler Makers' Association suffered from the curtailment of meetings just as did all other organizations in the railroad field. Unlike most of the others, however, it did not accept its fate with resignation. When meetings were impossible, through the energy and ingenuity of its officers, the association organized two "conventions in print," the first being distributed in 1931 and the second in 1933.

Then followed a limited business meeting of the association in 1935, and a meeting in 1937 at which no restrictions were placed on attendance. At the time of the 1937 meeting the association had a membership of 152, an increase of 87 from the time of the limited meeting in 1935.

Again in 1938 the activities of the association were somewhat curtailed in that a business meeting was held instead of the usual full association convention. Considering the difficulties through which this association has passed since 1930, it was a real accomplishment to be able to announce the waiving of dues for the current year.

But it is not the history of an organization, no matter how excellent its record, which recommends it for the support of its own constituency and of railway managements generally; it is the quality of its work and the influence of its programs on the daily work of its members. The program of the meeting to be held this month at the Hotel Sherman, Chicago, carries its usual quota of intensely practical topics. One of these topics, which has been under consideration for several years, is pitting and corrosion of locomotive boilers and tenders. This year, as in the past several years, the study of the practical aspects of this problem are supplemented by a contribution from an expert in its scientific aspects.

The association is also showing its foresight with respect to its shop problems by scheduling a paper on apprenticeship. Its work this year justifies a continuance of the confidence in which the association has long been held.

Trends in the Development of

Machine Tools

As this is being written there are many evidences that the railroads of this country are facing the possibility of increases in traffic that may establish new carloading records. It is a foregone conclusion that with a rise in industrial activity the railroads will be called upon to provide that backbone of volume transportation which no other agency is as well equipped to furnish. The ability of the roads to meet this increasing demand will depend on two important factors, equipment and men.

It is the equipment situation which immediately comes into the limelight when prospects of increases in traffic appear and the problem of furnishing sufficient equipment is one that can be solved, in so far as the roads themselves are concerned, primarily by throwing into high gear the activities of repair shops and stepping up the output of repaired and rebuilt cars and locomotives. In those cases where insufficient equipment exists or where equipment is in such condition as to make its repair or rebuilding of questionable certainty from an economic standpoint, it is fortunate that the industries which serve the railroads are in excellent position to make up the immediate deficiencies.

No one will question the vital importance of the railroad repair shops in the present situation, and because they are such an important link it is in order to speculate upon the conditions that surround their ability to produce and the factors which can contribute to an increase in their efficiency. In this latter respect there is no part of their facilities which has such an important all-around bearing on the efficiency of output as modern machine tool equipment. This being the case it is only fair to assume that to outline the developments that have taken place in the machine tool field in recent years and the influence of these developments on that kind of work which railroad shops are called upon to perform will provide a basis upon which to determine whether or not the shops are now in the best of condition to meet the demands that are to be made upon them.

Contrary to many opinions the railroad shop, as regards machine tool equipment, depends, for the most part, on general purpose machines rather than those designed for special purposes. Except for large, heavy duty machines used especially for the purpose of turning the treads of car wheels and locomotive tires the entire machine tool equipment of the average railroad shop is made up of units that are designed to perform the basic metal-working functions of turning, boring, milling, planing and grinding. Moreover, because of the fact that railroad machine work is a problem of producing a variety of parts in relatively small quantities rather than the production of large quantities of identical parts, special machines and special equipment are necessarily limited in application. So, in considering the adaptation of the modern machine tool to this kind of work it is important to know what has taken place in the development of the engine lathe, turret lathe, boring mill and vertical turret lathe, milling machine, planer and grinder that will contribute to an increase in output on the kind of work that has to be done.

The designers and builders of machine tools, regardless of the type, have had as a common objective the production of a tool that would remove greater quantities of metal in a given amount of time with a resulting accuracy of finish held to closer tolerances than ever before. Increases in metal-removing capacity depend upon a tool steel that will stand up under heavy cuts and, this having been provided, certain inherent changes in machine design leading toward heavier construction and better power transmission systems. Therefore a decided trend has been that toward the use of better materials, such as heat treated alloy steels, in the construction of all machine parts and toward greater weight which after all is necessary to insure the rigidity which eliminates vibration, increases the life of cutting tools and promotes greater accuracy. Ground gears, high-speed shafts running in anti-friction bearings, moving parts flooded in oil and more generous supplies of coolant to cutting tools are accessory factors which contribute their part to increased capacity.

The physical ability of the machine to remove more metal in a given time is only part of the story. When all factors are considered, production in finished parts at the end of a day is dependent upon reducing the "floor-to-floor" time on each piece to an absolute minimum. The part under consideration may be one requiring only one cutting operation or it may require several operations. If it is a one-operation job then the important factor is the ability to take heavy cuts at high speed and finish the job to the required degree of accuracy and quality of finish without loss of time. It is in the multiple-operation jobs where the machine designer has really made great strides in the last few years. Where a few years ago the lathe, planer, boring mill or milling machine performed one operation at a time the machine of today has combined the advantages of multiple cuts and additional cutting heads to make it possible to do two or three steps in the finishing process in less time than the older machine took to perform one step. The ability to make multiple cuts has been brought about by the development of tooling equipment which is responsible for the great increase in the range and capacity of standard machines.

Controls Play Important Part

A large part of the ability of modern machine tools to remove greater quantities of metal in shorter periods of time is due to control mechanisms—both integral and accessory—that enable an operator to make changes in speeds and feeds, and to start and finish operations with a facility and precision that did not exist in the machine tool of a few years ago. The development in electrical controls has not only greatly simplified the problem of starting and stopping a machine but has permitted the application of many devices that add greatly to the speeding up of the machine while at the same time making it a safer machine to operate. The use of automatic electric limiting devices has gone a long way toward making the modern machine tool fool-proof.

Hydraulic drives and controls have contributed immeasurably to the increase in usefulness of certain types of machines. The hydraulic drive, with its stepless speed adjustment and uniform cutting pressure, make it possible to produce finer finished work on planers, slotters and shapers and the higher return ratio of this type drive contributes to a substantial reduction in machining time.

Wheel Shop Machinery

High train speeds in both passenger and freight service have had the effect of making obsolete the existing machine tools used for wheel work. The older ma-

chines are not capable of turning wheels to standards of accuracy that are now demanded. In addition to the demand for increases in production there is now a positive demand for closer tolerances which the older machines can not meet. In rolled-steel car wheel work present operating conditions require that wheels be perfectly round and smoothly finished. In addition it is considered by some roads desirable to balance wheels and this factor, plus the element of thorough inspection, has resulted in the development of special machines which the wheel manufacturer is using to finish the plates of rolled steel wheels.

It is the turning of wheel treads, however, that presents the real problem as far as the railroad shop is concerned and it is in car wheel turning machines that developments have taken place of major significance. The new machines are capable of taking heavier cuts at 40 to 50 per cent higher cutting speeds and new tooling methods have made it possible to produce a smooth, chatter-free surface at higher finish-cut speeds than are used in the roughing cuts. The new machines, too, are designed to permit the turning of wheel sets equipped with roller bearings without the necessity of removing the bearings from the axles. In summing up the advantages of the new designs in wheel turning machines it is said that the ability of the machine to turn out work is limited only by the tool steel.

In reviewing the development in the machine tool field and its influence on the railroad shop one or two facts stand out. Five years ago the average age of machine tools in the average well-equipped railroad shop was over 20 years. Five years have gone by during which the railroads have bought comparatively little in the way of modern shop tools. The major developments in machine tools have been introduced during the past five years. The machine tool inventory of the railroads today is made up of units that fall far short of being able to compete with the machines that are available today. It is upon these obsolete machines that a substantial part of today's repair dollar will be spent and it is obvious that part of it will be wasted. Only an intelligent program of shop equipment replacement will eliminate such waste from future operations. The tools with which to do it are available.

Diesel-Hydraulic Locomotive

(*Continued from page 386*)

end of the Diesel engine. The operation of the converter does not depend upon the pressure developed by this pump. Its function is to keep the converter filled with oil. The flow of oil through the converter will be less than 20 gal. per minute. Auxiliary equipment cools the converter oil.

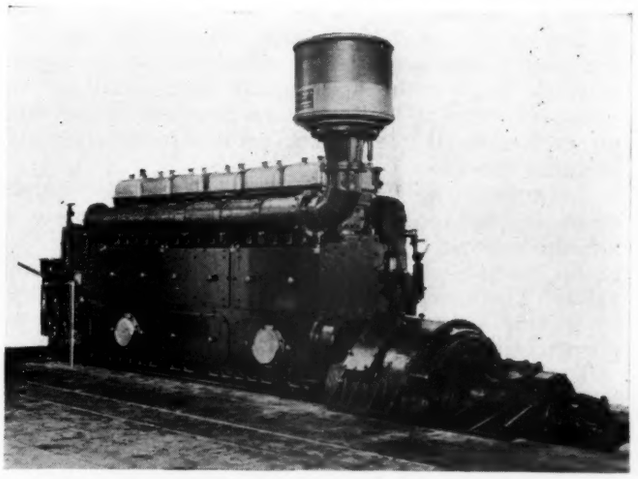
A selective two-speed gear box with a gear ratio of 1 to 2.5 is bolted directly to the housing of the torque converter. It has two identical and interchangeable gear sets with their positions reversed on the shafts so that two identical pinions and gears are always in mesh. The hydraulic clutch consists of plates with annular V-grooves which match a set of pistons carried in a drum attached to the shaft. The clutch plates form the hub of the gear.

To engage the clutch, pressure is applied to the pistons by oil supplied by a small high-pressure pump coupled to the torque-converter pump. To change from low to high gear, the shifting valve is moved by the operator from low to neutral to high positions. This relieves the pressure behind one set of pistons and applies pressure to the other set of pistons. It is not possible to engage both clutches at the same time as the oil supply to them passes through the shifting valve.

The locomotive with its load can be started in high or low gear without causing damage to the engine or the transmission due to the use of the hydraulic torque converter. As most of the slip during clutch engagement is taken up by the converter, the clutch wear is said to be very small and the clutches can be of the quick-gripping type. Road shocks are not transmitted to the engine, or engine shocks to the road bed, because there is no mechanical connection between the engine and the transmission.

The reversing transmission is rigidly held in position at the rear of the locomotive by wedges and bolts. It is of the compound type in order to obtain the necessary speed reductions with gears of proper dimensions. To obtain equivalent wearing properties and to divide the wear on both sides of the gear teeth, the first speed reduction is by two spiral bevel pinions with the drive shaft passing, with clearance, through their bores. This shaft carries an external-internal-tooth type of clutch which will engage either pinion to produce the forward and reverse motion of the locomotive. These pinions drive a large spiral bevel gear mounted on the hub of a herringbone pinion. This pinion drives a large herringbone gear mounted on the shaft of a second herringbone pinion which, in turn, drives the herringbone gear on the jackshaft.

The gears and shaft are accurately machined and mounted on roller bearings. An oil pump in the transmission supplies oil to the gears and bearings mounted in the upper part of the gear case and furnishes the oil pressure to operate the forward and reversing interlock. A self-aligning coupling of the external-internal-gear type connects the reversing transmission through the two-speed gearbox to the hydraulic driving unit.



The 400-hp. Hamilton-M.A.N. Diesel engine with hydraulic torque converter and two-speed gearbox

The torque converter permits the constant horsepower of the Diesel engine for any given throttle setting to be converted into varying combinations of locomotive speed and driving-wheel torque automatically, depending upon the traction demand of the load on the locomotive. At a demonstration at the Willard, Ohio, yard of the Baltimore & Ohio during the summer the performance of the locomotive was shown by starting, accelerating, stalling, restarting and holding a load of 300 tons on a 5 per cent grade through the hydraulic transmission. Throughout the demonstration the engine continued to operate without overload, its load and speed under throttle control.

Power Reverse Gear Operating Valve

The new Type M-3 power reverse gear operating valve, now being extensively introduced by the Barco Manufacturing Company, Chicago, is said to have given satisfactory results in over 600,000 miles of high-speed passenger test service. The valve is designed to assure equal total pressure on each side of the piston, except when the point of cut-off is being changed, thereby eliminating the usual cause of creepage. The cut-off position selected is held accurately, even in the event of failure of the air supply due to a broken pipe or other cause. These results are obtained through the application of check valves, in the admission ports between the admission valve and each end of the cylinder. Air can be exhausted from the cylinder through separate exhaust ports only by opening the individual poppet exhaust valves.

The theory of the balanced power-reverse gear is that the greater total pressure on the rear of the piston, due to the piston rod on the front of the piston, forces the piston ahead until the pressure per square inch on the piston rod end builds up to a point where the total pressure balances the total pressure on the back of the piston. Actually, however, as soon as the pressure builds up in front of the piston beyond the reservoir pressure, the higher pressure goes back into the line and the unbalanced condition continues, causing the piston to fluctuate, or travel back and forth, continually.

With the check valves interposed, as in the Barco M-3 valve, the air in the cylinder cannot come back into the supply line through the admission ports, thereby allowing the pressure per square inch ahead of the piston to increase until the total pressure is the same on each side of the piston, providing an accurately balanced condition.

A further feature of the M-3 valve is that in the event of breakage of the air supply pipe or failure of air, the reverse gear maintains its position, as the air cannot get back out of the cylinder through the admission valve. The air can be removed from the cylinder only by moving the quadrant lever and opening one of the poppet exhaust valves.

The M-3 valve is equipped with a double air-supply inlet, with ball check provided, so that an auxiliary air supply pipe may be applied and used in the event that the regular air supply pipe breaks or fails. With this arrangement, locomotive failures from broken air supply pipes may be eliminated, as in the event of failure of the supply pipe, it is only necessary to plug the broken pipe and proceed with the air through the auxiliary pipe. As the air remains in the cylinder, the valve motion will maintain its position without damage.

The Barco Type M-3 dual control operating valve is applicable for use with all types of power reverse gears.

T-Z Brake Hanger Wear Blocks

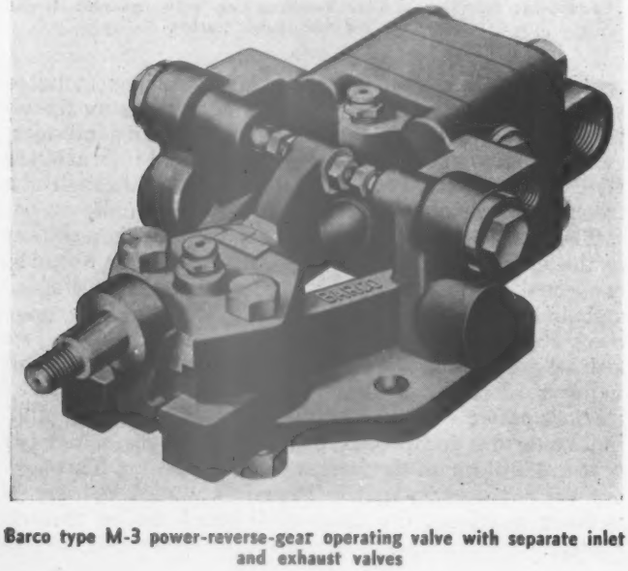
The T-Z Railway Equipment Company, Chicago, has recently brought out and placed on the market a pair of wear resisting blocks for use in connection with the brake beam hanger brackets of railway car trucks. The object of these wear blocks is to relieve the hanger brackets of direct wear by the link hangers supporting the brake beams.

These blocks are designed, as regards size and shape, to fit into the design of truck side bracket approved by the A. A. R. Committee on Brakes and Brake Equipment and to be secured within the recess of the bracket by the method recommended by that committee.

In order to give long service the blocks are made of cast steel and with strength sufficient to withstand the alternate stresses imposed by the link hangers in service. They may be readily removed from their recesses in the pockets of the hanger brackets which form an integral part of the truck side frame.

The blocks have large bearing surfaces to minimize the wear on the truck hanger brackets. The lower one has a full half circle bearing surface for the link hanger in order to decrease the tendency of both block and link hanger to wear. The upper one has clearance to permit oscillatory movement of the link hanger and to prevent binding of hangers and blocks, at the same time providing adequate resistance and strength against upper thrust during the operation of the brakes.

To keep the blocks in alignment they have a male and female joint arranged at right angles to the bearing surfaces for the link hangers and, as they bear against the semi-circular part of the bracket recesses and with the retaining bolt fully surrounded by both the blocks, movement in any direction is rigidly resisted.



Barco type M-3 power-reverse-gear operating valve with separate inlet and exhaust valves

Brake-hanger wear blocks developed by the T-Z Railway Equipment Company

EDITORIALS

Is the Repair Shop Equal to the Job?

Early in September, when freight car loadings were still over 100,000 cars below the present figure, the A. A. R. gave out a prediction that the railroads of this country could handle a 45 per cent increase in traffic by repairing approximately 200,000 freight cars and 8,000 locomotives then awaiting repair. In the short space of five weeks the loading figures have jumped to over 800,000 cars and seem to be headed for still higher levels. Reports are coming in from all parts of the country of repair shops being put on longer working hours and furloughed employees being recalled to the job.

Regardless of whether the traffic that the railroads will probably be asked to handle can be taken care of without difficulty or not there is one certain fact and that is that the car and locomotive repair shops of this country are going to be called on to deliver maximum output as long as the present emergency lasts, for it is upon the shop that the burden of producing today's motive power and rolling stock rests.

It is not strange that when the shops are shut down it is a rather difficult matter to get railroad management to give much serious consideration to the matter of the equipment of shops and enginehouses but when business picks up suddenly and the pressure of demand for cars and locomotives becomes acute then too the question of the adequacy of shop equipment becomes acute.

Two incidents have recently come to our attention that bring home a rather important lesson concerning shop equipment—both cases having to do with machine tools. Recently, in a back shop on a medium sized road it became necessary during a period of curtailed operations for several of the foremen to roll up their sleeves and turn out a couple of emergency jobs in the machine shop. Without giving too much thought to the implications of his remarks one of the foremen complained about the condition of the machine on which he had been doing the work and said that he didn't see how the regular machinist was ever able to to do a good job on such a machine.

Here were four lessons driven home all at once: first-hand knowledge concerning the actual and inadequate condition of an obsolete machine tool; the realization that a highly paid mechanic had been working under the handicap of poor tools; the consciousness on the part of the foreman that he was the one who was responsible for the condition of that machine and that it is his responsibility to recommend its replacement; and finally the knowledge that an obsolete tool not only throws away the company's money but stands in the way of maximum output when the pressure is put on.

The other incident comes from a machine tool salesman who reports having tried for over five years to sell a new machine in a certain railroad shop to replace one that is over 30 years old. The old machine had been repaired again and again until it is no longer possible to fix it in a manner that would make it possible to do accurate work. Still the shop engineer insisted that he could not recommend the purchase of a new machine because the net savings to be expected from it amounted to such a small percentage of the necessary investment.

"What are you going to do when the machine finally gives out completely?" asked the salesman. "Well, then we'll have to buy a new one, I guess," was the reply. And, this incident well portrays the situation in many shops. Many of the shop tools have gone beyond the point where they can deliver the output and the accuracy demanded today. Faced as they are with the need for making every repair dollar do the work of two the roads should quickly survey the shop situation and acquire the necessary replacement units without delay.

Training of Supervision

A unique experiment was made at the Conference on Human Relations in Industry at Silver Bay, N. Y., last month. A group of foremen from several industries sat about a table on the platform and discussed before the audience the question of what supervision expects of management. A by-product of this discussion was the apparent fact that when these men started in as supervisors—not so many years ago by the calendar, for apparently none of them was near the age of retirement—the common conception of a foreman was a hard-fisted driver. Today, on the other hand, although some of the old-fashioned foremen are still doing business, the general conception of a foreman is that of a man who understands human nature and is skilled in dealing with it. True, he must understand thoroughly shop methods and practices and the technical side of the job. Not the least of his functions, however, must be that of so dealing with the workers as to maintain their confidence and secure maximum performance from them.

The mechanical department is now busily engaged in enlarging its personnel, and undoubtedly it will be necessary to furnish additional supervision as its activities expand. Unfortunately the practices of the more advanced industries in selecting and training supervision have not been followed in the railroad mechanical department. Many industrial organizations keep a careful record of the performance and abilities of the work-

ers and are prepared at all times to make promotions from the ranks. Such promotions are not made on the record of the worker solely on the basis of his technical and craft ability, but he must possess those talents which are necessary for a successful supervisor. Moreover, when he is promoted he has either already received some coaching in how to handle the human element, or steps are immediately taken to see that he does receive training of this sort.

Very, very few efforts have been made by railroad mechanical departments either to be prepared promptly and with assurance to select men for promotion, or to train them to succeed as supervisors. If industry has found it a paying proposition to see that the supervision is properly trained, the same thing should also hold true of railroad organizations.

A wealth of helpful material is available. In some communities the railroad supervisors can take advantage of foreman training courses or executives clubs conducted by men from the industries in the same district. In other instances, capable instruction can be furnished for a group of railroad men at reasonable cost, which undoubtedly would be many times repaid in the increased efficiency and effectiveness of the supervisors.

The railroads will face a pretty stiff proposition in the months to come and the mechanical department must bear a large share of the increased burden. Surely no stone should be left unturned to prepare adequately to meet the situation. The training of supervisors is of first importance and is a paying proposition under any conditions, but of vital importance under present conditions.

Riding Qualities of Passenger-Car Trucks

On another page in this issue will be found a thoughtful discussion of the riding qualities of passenger-car trucks. The author, Dr. Giesl-Gieslingen, is favorably known to many of our readers as an engineer, which means that his approach to such a problem is quite the reverse of superficial.

Several railroads in the United States have already been working on the improvement of trucks to produce better-riding passenger cars of conventional weight as well as of the lightweight variety, and they have, no doubt, closely approached, if they have not arrived at, an agreement with the author's statement of fundamentals. In the main, however, the need for improvement has become evident where speeds have been most sharply increased. Since such increases in speeds have largely been associated with lightweight trains, interest in the question has not spread far beyond the roads where these trains are in service.

As schedules are more and more widely stepped up, the consciousness that conventional trucks are not the last word is bound to spread. This will occur not alone because of the increase in rates of acceleration of oscillations normally to be expected with increases in speed, but because a whole crop of new critical speeds will be encountered at which oscillations build up to violent proportions.

These two conditions—i.e., the increase in acceleration rates of normal oscillations and the entering of a range of new critical speeds—suggest two of the fundamentals touched on by the author of the article in question: first, the need for softer springs which increase the amplitude but reduce the rate of acceleration of oscillations; second, light, rigidly aligned truck frames with little or no spring protection from the axles, to eliminate critical speeds arising from lateral periodicity of the truck and the vertical oscillatory periodicity of the truck frames on the journal-box or equalizer springs.

Supplying softer springs has not proved a difficult problem. To produce a passenger-car truck frame light enough and strong enough so that neither it nor the journal bearings need protection from road shocks is less simple. In approaching this problem, however, it should be remembered that in each pound of weight lies the source of the inertia force against which the structure of which it is a part must be protected, and that weight poorly distributed adds less to the strength of the structure than it does to the force which tends to destroy it.

Economies From Streamlining

The general opinion of railway engineers in this country is that the value of streamlining a locomotive rests fully as much, and probably more, in improved public appeal than it does in reduced fuel consumption. With proper design, however, it cannot be questioned that a certain amount of decrease in head-end air resistance is experienced. In that connection, some figures, originally published in a German technical paper and quoted in the Railway Gazette of London may be of interest.

According to the article quoted, tests of a Class-03 standard two-cylinder Pacific locomotive of the German State Railway, showed that this locomotive, fully streamlined and operating at 62 m. p. h. can develop 1,455 drawbar horsepower, against 1,375 drawbar horsepower for a partly streamlined locomotive and 1,260 drawbar horsepower for an unstreamlined locomotive. At 87 m. p. h., the gain had increased to 385 drawbar horsepower, equivalent to 48 per cent, the maximum outputs being 1,185, 1,015 and 800 drawbar horsepower, respectively.

With the relatively larger Class-05 Pacific locomotive used on the fast Berlin-Hamburg runs, the coal consumption per drawbar horsepower hour was said to average 2.45 lb. at speeds of 60 to 62 m. p. h., as non-streamlined Class-03 locomotives have a consumption at the same speed of 2.75 lb. At a speed of 100 m. p. h.

the 4-6-4 locomotives consume 3.35 lb. per drawbar horsepower. Experience with the Class-03 Pacifics over a year in ordinary service, which includes both fast running and quite an appreciable proportion of slow running, is said to confirm the value of streamlining, the economy in coal consumption per mile being 11.5 per cent, and per-ton mile 15 per cent.

What Car Men Are Thinking About

Both the Chicago Car Foremen's Association and the Northwest Carmen's Association devoted their opening Fall sessions to the discussion of various questions and problems associated with the interchange of freight car equipment. The views expressed did not pretend to be authoritative, but were simply submitted as information with a view to correcting misconceptions and clarifying viewpoints about various phases of interchange rule applications.

Typical of some of the questions asked were the following: Why is it necessary to scrap an axle on account of a long journal, or worn collar? What facts justify placing the responsibility for cut journals on the handling or delivering line? If dust guards are essential and mandatory in the event of wheel changes, why should they not be maintained when the truck is dismantled for bolster or spring plank repairs, and a charge permitted if defective? What is the minimum and maximum standard practice height between the top of the coupler shank and the bottom of the buffer or deadwood? In charging for the application of safety bars by welding, is the welding on each side of the spring plank considered a new weld? What is the correct way to determine whether the flat spot on a car wheel is new or old? Why should not slid flat wheels, in connection with defective air brakes, be considered an owner's defect? Is it proper or improper to make out a defect card if a tank car has a metal plug screwed in place instead of a safety valve, this metal plug evidently having been applied when the tank car was built?

Some interest may attach to the answers given to a few of these typical questions. For example, in reply to the query about scrapping axles on account of long journals, the thought was expressed that a great deal of money is being wasted at the present time by scrapping journals which are over the wear limit in length, due to collar wear, and that it might be feasible to save a large proportion of this expense by the application of journals without outside collars, a design which is said to have given good results in test service on cabooses and other special cars. In this connection, apparently not enough attention is being paid to the smooth refinishing of collars after being cut, with the result that the rough surfaces cut into the brasses, causing excessive wear and subsequent early scrapping.

The question of making car owners responsible for cut journals keeps bobbing up from time to time and there is apparently increasing sentiment among many practical car men that the advantages of this radical change in previous practice might offset its disadvantages. The subject has been carefully considered in the past, however, by the A. A. R. Arbitration Committee and it is doubtful if the present rule will ever be changed, owing to the fact that cut journals are due to many causes, some of which, including waste grabs, are the result of operating conditions and cannot fairly be charged to owners, especially when they are private car companies.

In discussing push-pole pocket damage, which is an owner's defect, the question was asked if repairs are chargeable against the owners when associated with safety appliance damage, and is the latter chargeable to the owner. There was some sentiment to the effect that safety appliance damage in connection with damage to the push-pole pocket would make it a handling line responsibility, but the preponderant opinion was that two owners' defects do not make a delivering line defect. In other words, push-pole pocket damage is an owner's defect, and safety appliance damage is an owner's defect, unless involved with other delivering line defects; therefore, push-pole pocket damage and safety appliance damage, with no other Rule 32 condition, would both be owner's defects.

The discussion of these and other similar questions before the various associations of railway car foremen throughout the country serve a definitely useful purpose and should be encouraged, always with the understanding, of course, that the answers to the questions are accepted with reservations, as the A. A. R. Arbitration Committee is the final authority.

The Laboratory and Service Performance

In the last analysis, the best-equipped laboratory cannot of course duplicate service conditions which provide the rigid yard stick by which the performance of all types of new railroad equipment and appliances must be measured. It is especially unwise to draw hard and fast conclusions from laboratory tests of small-scale models which, however, have the advantage of being less expensive to conduct and frequently serve a very constructive purpose in pointing the way to improvements in design which may subsequently be given the acid test of road service.

One of the principal advantages of carefully conducted laboratory tests is that the test conditions can usually be controlled so as to study one variable at a time and analyze its effects. While any conclusions drawn must be subject to subsequent check in road service, it cannot be questioned that laboratory tests, utilizing the modern testing equipment and methods, take much of the guess work out of problems associated with the design of railroad equipment and appurtenances and hence serve a most useful purpose.

IN THE BACK SHOP AND ENGINEHOUSE

Shop Lifting Devices—Factor of Safety

By A. D. Hollis

Right now is a good time to check over shop-lifting devices for proper factor of safety; to anneal them, to whitewash and hammer-test the stressed parts. In examining shop-made lifting tools it will be found that most of them have an excessive factor of safety, and are so heavy that they are awkward to handle. This is not usually a serious defect, because railroad tools are subject to all kinds of abuse. Occasionally, a shop-designed tool will be found with a very low factor of safety. Locomotive parts are heavier than they were 20 years ago, and the crane attachments may not have kept up with the procession. High wheel locomotives have come back and tires and wheels have greatly increased in weight.

Proper Factor of Safety

The ratio of the ultimate strength of the material to the working stress is the factor of safety, a term which, for several reasons, is misleading. A tool or structure with a factor of four cannot resist successfully loads four times as great as the maximum specified for safe working stress. Deformations will occur. In use, the factor of safety is really a divisor. The factor of safety is derived by taking the product of four other factors. The first of these is the ratio of the ultimate strength of the material to its elastic limit, somewhat less than two in the case of iron and steel; so this factor is considered to be two. The second factor depends on whether the load is static or variable. This factor is one (or may be omitted) for a steady load, and is two for a load varying between zero and a maximum such as occurs in connection with crane hooks, chains, etc. If the stress alternately is tension and compression (at the piston rod of a steam engine), then this factor is three. The third factor concerns the method of applying the load, and for suddenly applied loads (not impact loads) is two. The loads occurring in crane operation are sudden loads. Another factor is sometimes added to cover unknown conditions like deterioration, overloading, etc. The first three factors (two times two times two) have produced a factor of safety of eight, which appears to allow an excessive margin of safety as shop tools are supposed to be intelligently used and inspected.

Figure 1*A* shows a convenient tripod-like arrangement of hooks used to handle locomotive tires. As in the case of a chain cluster, the angle at which the stressed members are used increases the stress and reduces the factor of safety. The central member to which the legs are attached is ruggedly designed and may be a forging, or a piece of ⅝-in. boiler plate cut and bent to suit, and has an excessive factor of safety. The legs are flattened at the upper end, where the pin hole is drilled, so that they will not fail by pulling out at the eye. The capacity of the device is limited by the shearing strength of the three pins that secure the legs to the central member, and is not difficult to figure. The stress is greatest when the legs are spread wide, as is necessary to handle the largest locomotive tires.

An 80-in. (outside diameter) driving wheel tire 3¾ in. thick weighs about 1,600 lb. . If the tire could be lifted with the legs straight this would place a load of 533.3 lb. on each leg of the hook cluster. Used at an angle of 15 deg., as shown, the tensile stress on each leg and the shearing stress on each pin would be 2,059 lb. The stress is inversely proportional to the sine of the angle at which the stressed member is used. If ⅝-in. rivets were used for pins the tool would have a factor of safety of more than 5 when used at an angle of 15 deg.

This tool might be overloaded by using it to handle a tire and wheel assembled. The weight of a large main wheel center, including the lead in the counterbalance and the tire, would be about 5,700 lb. When used with the legs at 15 deg. this would place 7,330 lb. shear on each pin, and the ⅝-in. rivet would then have a factor of about two, which is not safe; for a factor of from six to eight is considered the proper safety factor for lifting tools not subject to shock loads.

At *B* is illustrated a common and convenient type of tire-lifting C-clamp used to handle hot tires on to the wheel centers with the crane. The ⅝-in. chain will break at 20,000 lb. and has a factor of 12.5 (the heaviest tire weighs about 1,600 lb.). The ¾-in. by 2-in. lug which supports the tire looks like the weak part of this clamp. The area of this lug in shear is 1½ sq. in., and ordinary steel of this section will support over 50,000 lb. in shear. A tire weighs only 1,600 lb., but the factor is not as excessive as it appears, for the weight is applied at the corners of the lug and in handling tires onto the wheel centers the clamp and its attached chain may raise the wheel from the horse for a few moments, and support half the weight of a pair of mounted wheels. Occasionally it may be subject to shock loads.

The attachment *C* is used in connection with a crane to apply rods to locomotives, and to make other lifts under the running board or elsewhere, where the crane hook itself cannot be brought into position directly over the part to be lifted. The loop on the upper end is passed over the crane hook and a suitable chain is passed through the bottom loop. The greatest stress is in the long vertical member and at the 90-deg. bends. The section of the horizontal members is increased where farthest from the load to approximate a beam of constant strength. The heaviest rods weigh about 1,000 lb., and, without going into theory or calculations, experience has proven a maximum section of about 2 in. wide by 3 in. deep is satisfactory for this hook.

The hooks, shown at *D* and *E* are very useful around the shop. *D* is made in various sizes, and if large enough may be used for handling stoker elevators inside the cab. The liberal dimensions permit it to be passed under the cab roof from the rear. In a smaller size it may be used for putting up pumps under the running board. *E* is a specially-designed hook used for lifting tires without flanges out of the heating pit. Its peculiar shape permits passing it under a tire that has been blocked up a few inches.

Two views are given of a special device *E* for putting up air pumps and feed water pumps under the running boards. It is attached to the pump by two steel studs, having a pipe thread at one end, that are screwed into

(*Continued on page 405*)

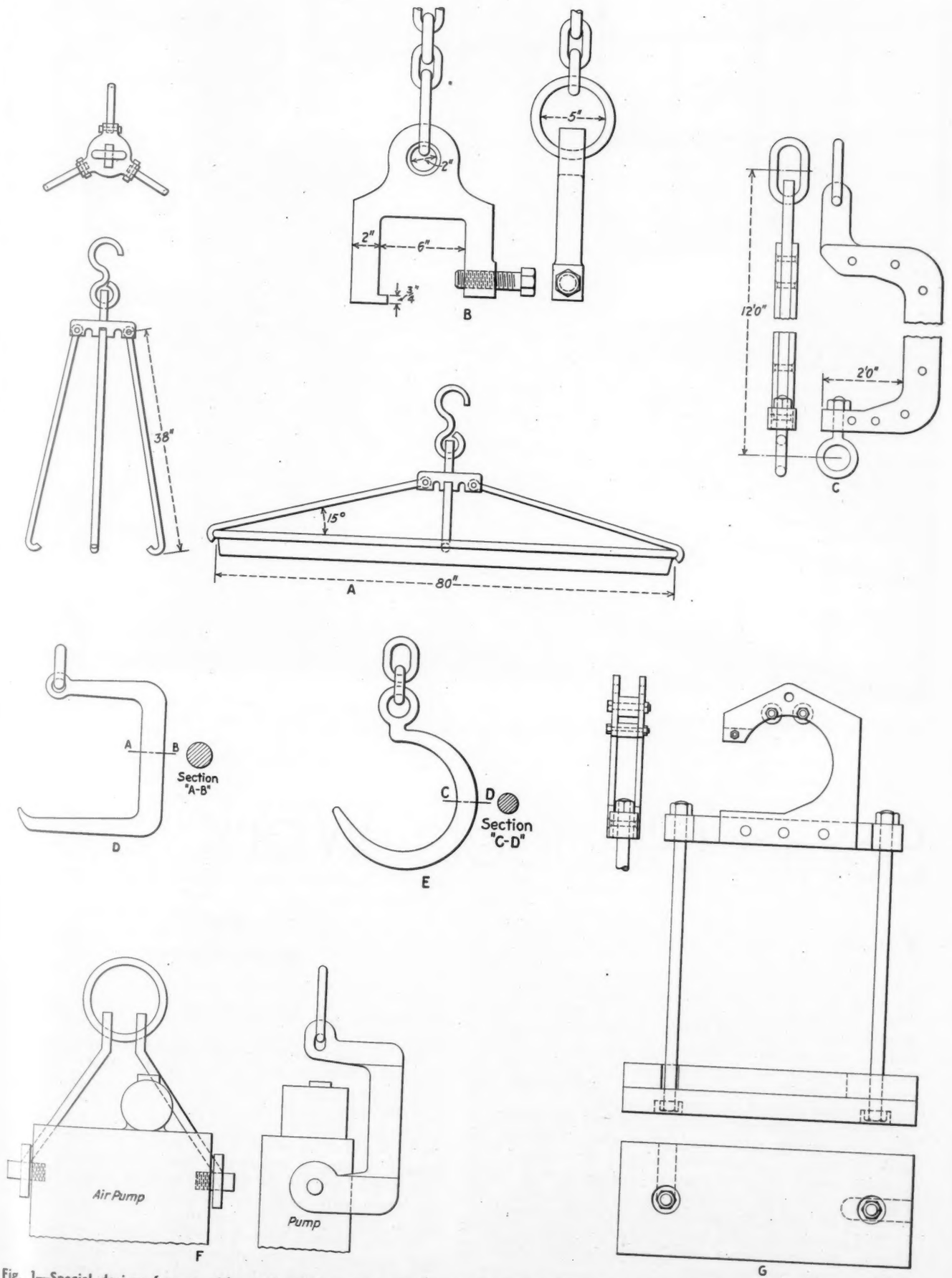


Fig. 1—Special devices for use with a railroad shop crane in lifting (A) and (B) driving wheel tires, (C) driving rods, (D) stoker elevators, (E) bald flange tires, (F) air pumps, (G) counterbalance weights

Jim, the roundhouse foreman, watched the procedure through a window in the roundhouse office. "Dammit," he said, "if we had a couple more engines we wouldn't have to finish repairs while the engineer is oiling around."

Some Gadgets Work

by
Walt Wyre

THE 5088 was called for an extra west at 3:30 p. m. The hostler took the engine out of the roundhouse at 2:45. She had nearly a hundred pounds of steam and the air pump on the left side was hanging on with two bolts. A machinist and a pipe fitter followed the engine around while the hostler and his helper took on water, fuel oil, and supplies. Every time the engine stopped, the machinist would take a few turns on a nut and the pipe fitter would smear graphite on pipe threads and make another attempt to connect a union.

Jim, the roundhouse foreman, watched the procedure through a window in the roundhouse office. "Dammit," he said, "if we had a couple more engines we wouldn't have to finish repairs while the engineer is oiling around. Guess I'd better send some one out to help the pipe fitter. He seems to be having trouble getting the pipes connected."

"Did you see this letter from the superintendent?" John Harris, the roundhouse clerk asked. "He's hollering about engines not steaming."

"Yeah," Evans replied. "I saw it. I got another from the road foreman of equipment. He says some of the engines are not lubricating and they're foaming pretty bad."

The foreman went to the roundhouse and told another pipe fitter to lend a hand on the 5088. He took a turn through the roundhouse, then went out to see how the 5088 was coming along.

The mechanics were gathering up their tools getting ready to come in when Evans got there. He walked around the engine and at the same time made a mental note to put her over the drop-pit soon as possible. Driving boxes were badly worn, some of the tires looked like a gauge would condemn them.

Fifteen minutes later the 5088 pulled out from the lead, crossed over the main to number one track and coupled on to one hundred and fifteen reefers. The switch engine had already pumped up air on the train

and it was ready to leave almost as soon as the engine was coupled.

It is slightly up grade going west out of the Plainville yard, but the hoghead cut the booster in and the 5088 started the 115-car train with hardly a jerk.

"Thought maybe I might see the switch target dragging along behind the caboose," Evans remarked as he watched the train pull out. "They took everything else in the yard."

"And they holler about engines not steaming!" John Harris added.

"If Stevens, the engineer, forgets to use the blow-off cock pretty regular, they'll be hollering about her foaming, too," Evans said. "She was reported for a boiler wash when she came in but didn't have time; had to just change the water and let her go."

Both prophecies came true. The train had to double the hill at Monroe, then they couldn't make Lake View for the Limited and had to go into a 75-car siding at Clay switch. The Limited was delayed fifteen minutes sawing by the extra.

Next day the road foreman came in with a report long as a street walker's dream. Then he hunted up Evans and told him about the engine.

"Outside of the engine pounding all over, the boiler is dirty as a smoking car joke," the road foreman said. "If it hadn't been for the booster, the sixteen-hour law would have caught them before they got in," the road foreman said.

"Yeah," Evans bit off a piece of horseshoe about the size of a one-inch nut, "they hang all the cars this side of Chicago on a locomotive and expect to make passenger train time. On top of that, we haven't got enough engines and don't have time to get the work done."

"Maybe you're right," the road foreman admitted, "but that's what they want and that's what they're going to have to satisfy them. It's your job to see that the engines are in shape to go and my job to see that they get over the road or explain why."

"Yeah, and they keep expecting more all them! Used to be a foreman was scared to death when he had to turn an engine that had run over a hundred mile division without working it, now they expect one to run twelve or fifteen hundred miles, stay in the roundhouse six or eight hours and keep on doing that for months."

Evans went to the roundhouse leaving the road foreman in the office.

BUSINESS began to pick up on the S. P. & W. Cattle were being rushed to market to take advantage of a good price and they had several extra passenger trains each week of tourists returning from the Fairs.

The 5088 made one trip too many and broke a main pin. Then the engine was run over the drop-pit for overdue classified repairs. The wheels were ready to go up and they expected to break her in on the west local next day when a large box was brought into the machine shop from the storeroom.

"What's that?" Evans asked the portable crane operator who brought the box in.

"Don't know," the crane operator replied. "The storekeeper said to deliver it to you. I thought it was some special material you were needing right away."

"Open it up and we'll see what it is," the foreman told a machinist.

The nut-splitter cut the wires that bound the box and pried the cover off with a bar.

"Whatever it is, it surely is well packed," the machinist said when he saw half a dozen cardboard cartons packed in excelsior.

Evans opened one of the cartons. It was filled with electrical fittings, junction boxes, connectors, a fuse receptacle, toggle switch, and several other dinguses the foreman didn't recognize.

"It must be something the electrician ordered," Evans said replacing the lid on the cardboard box.

"This don't look like anything electrical." The machinist pulled out what looked like an overgrown Dutch oven without a lid. "It's got two places to connect pipes."

While the foreman was puzzling over the contents of the box, H. H. Carter, the master mechanic, came in. "Well, I see you got it," the master mechanic said.

"That's right, but damned if I know what it is," Evans replied.

"It's an automatic blow-off system." The master mechanic dug into the large box and brought out a fair sized one of cardboard labeled "glass." Fitting snugly in the cardboard box was one of iron with a hinged door. There were two bulls eyes, one red, the other yellow in the door of the iron box.

"Looks like some kind of signal," Evans said.

"You are partly right," the master mechanic said as he unscrewed the wing nut that held the door closed. "It's a signal and the apparatus that operates the blow-off, too. When the boiler gets to foaming, the yellow light comes on. A jigger in here makes an electric connection that opens an air valve. The air in turn opens a blow-off valve."

"Sounds kinda complicated," Evans said. But what's the red light for?"

"If the foaming gets too bad and gets where it's likely to cause priming, the red light comes on. That's a signal to the engineer to help things out by opening a hand operated blow-off cock. It's not very often that's needed."

"What are we going to put it on?" Evans asked.

"Put it on the 5088," Carter said. "You've got her tied up on the drop-pit."

"But I was figuring on getting the 5088 finished today and breaking her in on the west local tomorrow," Evans said dolefully.

"Better hold her and put the outfit on," the master mechanic said. "The superintendent of motive power wants it put on soon as possible," he added.

Evans groaned. Holding the 5088 meant revising the engine lineup for tomorrow with nothing to use in place of the 5088. The 2746 that had been on the west local was due a monthly inspection and a two-year test besides. He was rushing the engine on the drop-pit because there was nothing else for the local, but he knew by Carter's tone of voice there was no use arguing the point.

"Blue-prints for installing the outfit are in my office," the master mechanic said. "Better get started on it pretty soon."

"O. K., I'll go down and get them in a little while."

Evans went to the roundhouse office and sat down in a chair with a thump that threatened to drive his seat through that of the chair. "Things have sure come to one hell of a pass on the railroad!" he snapped.

"Now, what's the matter?" the clerk asked without a great deal of interest.

"It was bad enough when they put on air reverse gears and automatic whistle blowers; now I've got to hold the 5088 to put on an automatic blow-off arrangement! Next thing you know they'll have an automatic nose wiper for the engineer when he's got a cold! I don't see why the engineer can't open the blow-off cock when an engine gets to foaming bad enough to need it!"

"What are you going to run on the west local tomorrow?" the clerk asked.

"Wish I knew! The way it looks now there won't be any west local tomorrow."

"The dispatcher asked me a little while ago what we had for the local tomorrow. When I told him the 5088 he said O. K. Must be figuring on a heavy train," the clerk added.

"The only thing I can see now is to drag the 1879 out of storage," Evans said. "It might drag thirty cars but it wouldn't handle many more than that. Guess I might as well go to the master mechanic's office and get the prints on that outfit."

THE master mechanic had the prints laid out on a desk looking them over when Evans got there. "Doesn't look like that outfit is going to be so complicated to install," Carter said, "just a couple of small holes in the top of the boiler and a little piping and wiring."

"Looks like we ought to make it in two or three days," Evans admitted after he had looked over the blue-print. "I'll get started on it right away." He rolled up the prints and went back to the roundhouse.

Bill Cox, a machinist, Ned Sparks, the electrician, and two pipe fitters, Sam Crawford and Steve Williams were given the job of installing the automatic blow-off system. There was more pipe work than anything else, but the pipe fitters couldn't do much of it until the machinist had mounted the various parts of the equipment.

Cox made templates for brackets to mount the control box and the solenoid air valve while a boilermaker was cutting and tapping the two holes on top of the boiler just back of the steam dome for the two electrodes that controlled the height of foam in the boiler. In the meantime Sparks was cutting the right handrail to put in a junction box to connect conduit for the wires from the electrodes.

With the gang installing the automatic blow-off and two drop-pit machinists and their helpers working on the engine, it looked like a government job. Fortunately the work was distributed over the engine so that there was less interference than might have been expected and work was progressing nicely.

About 3:15 Evans came out to see how things were coming along. He found that the wheels were up and rods just about finished. The control box for the blow-off was mounted in the cab as was the solenoid air valve. The holes in the boiler were drilled and tapped for the electrodes and the iron pot that resembled a Dutch oven was mounted on top of the boiler just ahead of the cab. The latter Evans had learned was something like a muffler and separator to reduce the velocity of the blow-off steam and separate steam from water. A pipe from the separator extended down the side of the boiler and connected to a funnel shaped discharge about ten or twelve inches higher than the top of the rail. The discharge which wasn't yet connected would be about even with the ends of the ties.

While the foreman was watching the work on the 5088, the roundhouse clerk came rushing out like a Scotchman who had heard of free lunch with beer thrown in. "Say!" the clerk panted, "I told the dispatcher what you said about running the 1879 on the west local tomorrow and he blew up like a peace conference in Europe!"

"What did he say?" Evans asked.

"I can't remember all he said, but he wants a big engine on the west local in the morning. He wants to talk to you."

"Dad blast it!" Evans snorted. "If they would just give us a few engines instead of spending the money buying doodads to make things easier for engineers, I might have a big engine when it's needed!" He started to the office to talk to the dispatcher.

After the foreman talked to the dispatcher it was easy to see why the 1879 wouldn't do for the local. In addition to about forty cars of stock to be picked up, twenty-odd cars of merchandise and half a dozen cars of oil a contractor was moving, eight cars of heavy equipment to be picked up at Anderson spur, the 1879 couldn't pull that much train on level straight track.

"I'll see what I can do," Evans told the dispatcher and hung up.

The foreman checked over every engine in the house and all he had left for the local was either the 1879 which was out of the question or the 5088 and he didn't see how it could be finished.

Evans went back to the drop-pit. He found the men all working away without the discussion and argument that was usual when a new piece of apparatus was being installed.

"Looks like you are getting along pretty well," Evans said to Cox.

"Yes, that outfit looks complicated, but it's not so bad. The blue-print shows every thing so clear we are not having any trouble with it."

"How long will it take you to finish your part?"

"Oh, I'd say two or three hours by pushing a little," the machinist replied. "The pipe fitters have quite a bit, though, and I don't know just how much the electrician has."

Evans was again agreeably surprised when he learned that the electrical work could be completed in four or five hours with some one to help the electrician pull in the wires and test for connections. The pipe fitters said the night man would be able to finish the pipe work if he didn't have too much on running repair work.

"Well, I'll be damned!" Evans said. "I thought it would take two or three days at least to get all of that apparatus hung on an engine."

He went back to the office and told the dispatcher he could have the 5088 for the west local.

The road foreman called and said he would ride the engine next morning. He usually rode ones just off the drop-pit and he wanted to see how the new automatic blow-off worked.

IT was a heavy day for the local. There was work at every station and they picked up more than they set out at every station until by the time they reached Monroe they had seventy-nine loads.

"Can we make it in ahead of the Limited?" the conductor asked the engineer.

"If this hog keeps pulling like it has been, we can," the engineer said. "If we stay here for the Limited, the sixteen-hour law will get us."

"What about Clear Creek hill?" the conductor asked. "If we have to double that, we'll lay the Limited out and the sixteen-hour law catch us besides."

"It's a pretty tough grade, and we got a heavy train, but I believe she'll make it," the hoghead said. "What do you say we try it?"

"O.K.,—high ball."

If the engineer had known that the last tank of water he took had not been treated he wouldn't have been so confident. The treating plant is automatic and no one had discovered that it had not been working for some time. And the water at Monroe is awful bad, it requires very heavy treatment for boiler use.

Both the engineer and the road foreman noticed soon after leaving Monroe that the yellow indicator light began to show more often and the automatic blow-off to operate. Once when the engine was working hard the red light came on. The engineer opened the hand operated blow-off and both lights went out indicating that danger of priming was eliminated. A brisk wind came up from

the southwest just before the train started down the hill towards Clear Creek.

"Better hit it pretty hard," the road foreman yelled to the hoghead. "It'll take all we got to get up the hill."

The engineer nodded and widened on the throttle. When he crossed the bridge the train was going at least five miles an hour over the speed limit for freights of fifty miles an hour, but it didn't hold that speed long. The curve and grade west of the bridge reduced the speed by half in two train lengths and they hadn't reached the steepest part.

Gradually the train slowed down until each exhaust was a slow cough. The engineer cut in the booster and the engine gained a little speed.

"Going to make it!" the engineer said. "A hundred yards more and we'll be over the top."

At that moment the yellow indicator light came on and the automatic blow-off opened. The water in the boiler was foaming.

Two days later the road foreman was telling Evans about it. "If it had not been for that automatic blow-off we would never have made it over the hill. We took over half a tank of water at Monroe that hadn't been treated."

"Couldn't the engineer open the blow-off cock when it needs it?" Evans asked.

"The engineer could," the road foreman replied, "If he could see inside the boiler and tell when it needs it. By the time the engine starts slopping over damage is already done. The automatic blow-off works from the inside and operates before foaming is bad enough to cause trouble. It'll cut boiler washing in half or more and increase the efficiency of an engine."

"Guess they're all right," Evans admitted. "Wish they would equip all of the engines. Maybe they would stop some of the complaints about engines not steaming and not lubricating."

"They would help a lot," the road foreman said.

Safety Factor of Lifting Devices

(*Continued from page 400*)

the pipe openings of the pump. An 8½-in. cross-compound air compressor weighs 1,600 lb. and a feed water pump (Elesco) weighs 1,835 lb. If these lifting hooks are made out of ¾-in. by 3-in. flat iron, the factor of safety will be ample.

A frame with a roller-bearing head is shown at *G*, being used for hanging weights on locomotive crank pins in counterbalancing. One side of the head is open, making the device appear like an inverted hook. This opening permits convenient handling on and off the pins by the crane. The hole at the top is used for attaching the crane chain by means of a ¾-in. pin. The section of greatest stress (opposite the open side) consists of two members ½ in. by 3 in. and has a factor of safety of 3.74 with a load of 2,600 lb., the maximum weight used.

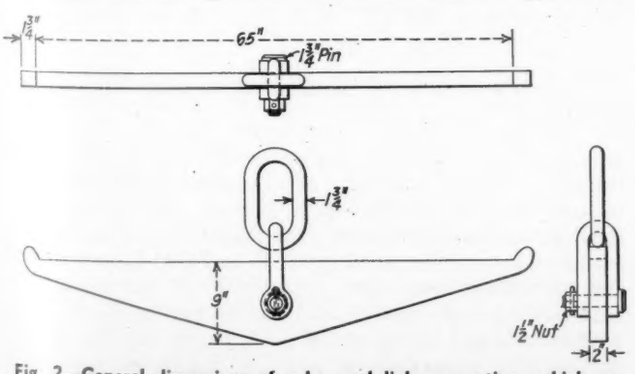


Fig. 2—General dimensions of a bar and link connections which may be safely used in lifting locomotive driving wheels

The method of figuring the stress on the hook member of *G* follows: The distance from the center line of the device to the center line of the section of greatest stress (mentioned in the previous paragraph) is 8 in. (dimension not shown in the drawing). Obviously, 2,600 lb. times 8 in. equals 20,800 in.-lb., the bending moment.

The fundamental formula for beams, as given in various handbooks, states that stress equals bending moment divided by section modulus, *S* equals $\frac{MB}{Z}$. The two ½-in. by 3-in. sections that support the weight may be considered as one section 1 in. by 3 in. Further reference to the handbook shows that the section modulus of a rectangular beam is $\frac{bd^2}{6}$ when b is breadth of beam and d its depth.

Substituting the dimensions of the given beam:

$$\text{Section modulus} = \frac{1 \times 3^2}{6} \text{ or } 1.5$$

$$\text{Stress from bending moment equals } \frac{20{,}800}{1.5} \text{ or } 13{,}866 \text{ lb. per sq. in.}$$

The section is also subject to a straight tensile load of 2,600 lb. which, divided by the area of the section, gives 867 lb. per sq. in., which should be added to the unit stress, due to the bending moment. 13,866 plus 867 equals 14,733 lb. per sq. in. Assuming the tensile strength of steel to be 55,000 lb. per sq. in. the device has a factor of safety of 3.74.

Fig. 2 shows a bar used in connection with a traveling crane for handling locomotive wheels. The ends of the bar pass between the spokes, and with this bar the crane operator can pick up a pair of drivers in one part of the shop, handle them to another location, set them down on the track and disengage the bar without any assistance from the floor. The bar may be easily disengaged by the crane operator after the wheels are placd in a lathe or other machine.

The weight of locomotive wheels has increased in the last few years and crane equipment should be examined to see if it has the proper factor of safety. A pair of the heaviest main wheels assembled complete would weigh about as follows:

2 crank pins	1,200 lb.
2 eccentric cranks	400 lb.
2 wheel centers (72-in. diameter)	6,000 lb.
Lead in 2 counterbalances	4,000 lb.
2 tires (80-in. diameter)	3,200 lb.
11-in. axle assembled (housing and roller bearings	4,700 lb.
Total	19,500 lb.

An examination of the bar illustrated shows ample strength in the link connection as a 1¾ in. chain has a safe working load of 55,300 lb. This beam approximates a beam of constant strength and its strength (disregarding the hole in the center) may be calculated by the formula:

$$P = \frac{2\,Sbh^2}{3L}$$

Where

P = the load
S = stress in. lb. per sq. in.
b = the breadth of the beam (2 in. in this case)
h = the height of the beam
L = the length of the span

Substituting the actual values

$$19{,}500 = \frac{2 \times s \times 2 \times 9^2}{3 \times 60}$$

(60 is the actual length of the beam for the load is applied 2½ in. from the end. The length shown in the figure is 65 in.)

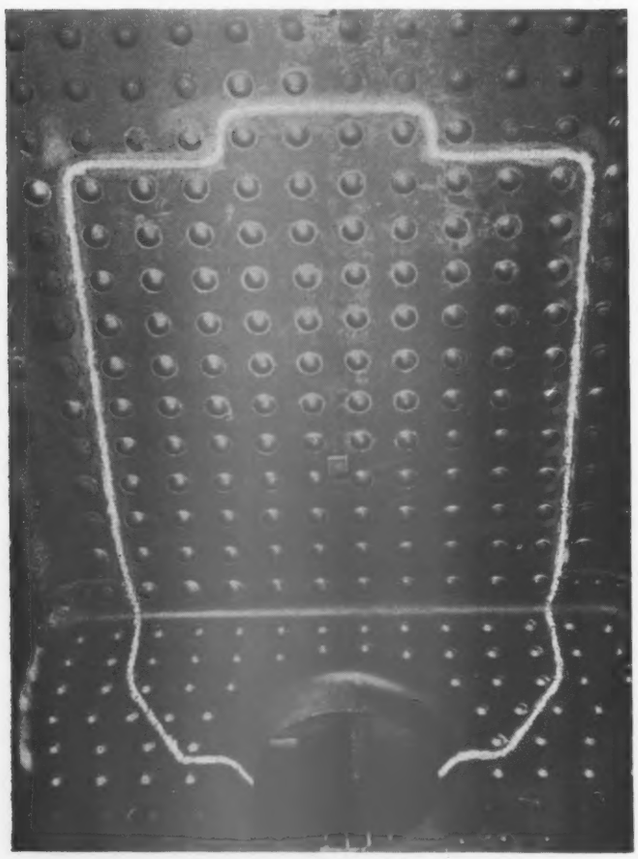
Solving

S equals 10,830 lb. per sq. in., and assuming the tensile strength of steel to be 55,000 lb. per sq. in. the bar has an apparent factor of safety of slightly more than five, which would be somewhat reduced by the hole in the center, but it will be more than four.

Unusual Boiler Patch On Argentine Locomotives

Ten Argentine locomotives have been fitted with boiler patches similar to the one shown in the illustration. E. Crapper, a member of the Master Boiler Makers' Association and chief boiler inspector of the Buenos Ayres Southern & Western, Argentine Republic, described this unusual patch in a letter to A. F. Stiglmeier, secretary-treasurer of the association.

The patch is fitted in a Belpaire boiler with a working pressure of 200 lb. per sq. in. which has the crown stays riveted over on the fire side. The patch extends to the fire-door opening in one piece and eliminates the riveted seam at the top of the inside door sheet for the width of the patch. As the distance from the intersection of the crown sheet with the door sheet was too great for safety, another row of ten stays was applied on the line of the old riveted seam. The electric welding was done entirely from the inside of the firebox. The rough appearance of the weld in the illustration is the result of marking the weld with chalk for photographic purposes.



A single patch welded to the crown and door sheets in the firebox of an Argentine locomotive

The locomotives are oil burners and previous to the application of these patches, a downward bulging of the riveted seam occurred at the top of the inside door sheet, together with bulges in the sheet between the crown stays at the back of the firebox and between the stays over the door opening. Since the first of these patches was applied in 1930 no trouble has been experienced with them.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Is It Permissible to Weld Bracket Studs to the Boiler?

Q.—Is the use of studs welded to the shell or firebox of a locomotive boiler permissible?—F. L. C.

A.—The use of studs welded to the sheet instead of drilling and tapping the sheet for the stud, depends a great deal upon the purpose and location of the stud. Welded studs are being used to some extent by some railroads.

Welded studs for small pipe clamps or miscellaneous brackets, other than running-board brackets, on the firebox, backhead and throat sheets, would be permissible. However, before applying welded studs to the shell of the boiler, it would be advisable to secure the approval of the local I. C. C. Inspector or the Bureau of locomotive Inspection.

Calculating the Thickness of Steam Pipes

Q.—Please give formulas for computing the thickness of steam pipes?—M. F. R.

A.—In determining the thickness to be used for pipes at different pressures and for temperatures not exceeding 750 deg. F. for steel or iron pipe, and 406 deg. F. for brass and copper pipe, the A. S. M. E. Boiler Construction Code provides the following formulas. For pipes having nominal diameters of from ¼ in. to 5 in.:

$$P = \frac{2S}{D}(t - 0.065) - 125$$

For pipes of nominal diameter over 5 in.:

$$P = \frac{2S}{D}(t - 0.1)$$

where P = working pressure in lb. per sq. in.; t = thickness of pipe wall, in.; D = actual outside diameter of pipe, in.; S = 12,000 lb. per sq. in. for seamless medium carbon-steel pipe; S = 9,000 lb. per sq. in. for seamless low-carbon steel pipe; S = 7,000 lb. per sq. in. for lap-welded steel pipe; S = 5,000 lb. per sq. in. for butt-welded steel pipe; S = 5,300 lb. per sq. in. for lap-welded wrought-iron pipe; S = 4,500 lb. per sq. in. for butt-welded wrought-iron pipe or for brass pipe and S = 4,000 lb. per sq. in. for copper pipe.

With the Car Foremen and Inspectors

Union Pacific Builds

Lightweight Box Cars

First order for 2,000 fifty-ton cars will be completed in October—2,000 additional cars authorized

Stencilling one of the new Union Pacific 50-ton box cars recently built at Omaha shops

IN MAY of this year, the Union Pacific started work on an extensive car-building program involving the construction of 2,000 fifty-ton box cars which included 1,900 Class B-24 cars and 100 Class B-25 cars, the latter being unique in that they are especially designed and equipped for Challenger high-speed merchandise freight service. The entire order for 2,000 cars was allocated for building at company shops as follows: 600 cars at Omaha, Neb.; 700 cars at Grand Island, Neb.; and 700 cars at Portland, Ore. It is expected that this car-building program will be completed by the latter part of October, at which time work will be begun on an additional order of 2,000 cars, practically identical with the B-24 design.

The 1,900 Class B-24 cars embody lightweight construction of modified A. A. R. design for general freight service. No attempt was made to design the lightest car possible, but the objective was to design a light car which would give the greatest number of years service with a minimum of repairs and also to provide a car which would afford the best possible protection to the lading.

As shown in the table, the new Class B-24 box car has a lightweight of 39,700 lb. which may be compared with 45,100 lb. for an earlier type of Union Pacific box car (Class B-19) of A. A. R. design, incorporating riveted open-hearth steel construction, fully lined and having the same size and cubic capacity. The total saving of 5,400 lb. includes 3,480 lb. in the car body due to the use of low-alloy high-tensile steel and welded construction in the underframe; also 1,920 lb. in the A. A. R. spring-plankless trucks which have low-alloy, high-tensile steel side frames as well as bolsters and one-wear wrought-steel wheels. As compared with some still earlier 50-ton box cars of conventional riveted steel construction with relatively heavy trucks, the Class B-24 car saves up to 9,000 lb. of dead weight.

Comparative Dimensions and Weights of Two Union Pacific 50-Ton Box Cars

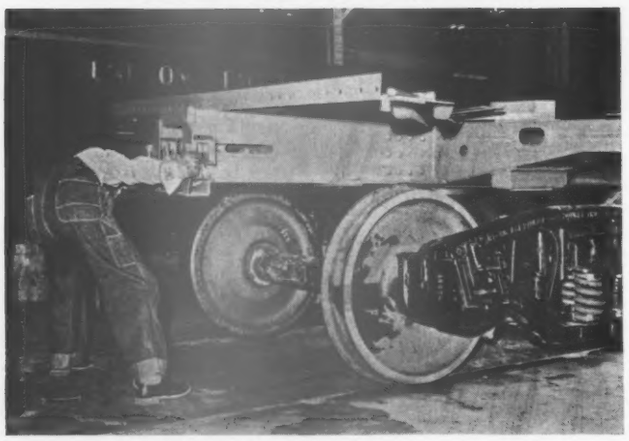
	B-19	B-24
Class of car	B-19	B-24
Year built	1936	1939
Structural material	O. H. steel (riveted)	H. T. steel (riveted and welded)*
Inside length, ft.-in.	40 - 6	40 - 6
Inside width, ft.-in.	9 - 2	9 - 2
Inside height, ft.-in.	10 - 0	10 - 0
Cubic capacity, cu. ft.	3,730	3,730
Lightweight of car, lb.	45,100	39,700
Load limit (revenue load)	123,900	129,300
Ratio pay load to gross load	0.733	0.765
Detail weights, lb.:		
Car body (incl. underframe)	30,000	26,520
Trucks†	15,000	13,180
Underframe	8,550	7,518

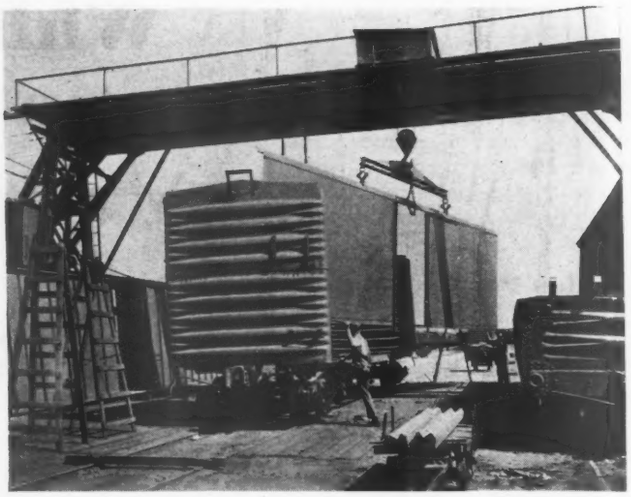
* Car body mostly riveted—underframe welded.
† Both types of trucks are spring plankless with H. T. steel bolsters. The B-19 has Grade-B side frames and cast-iron wheels. The B-24 has H. T. steel side frames and one-wear steel wheels.

Principal Features of the Car Design

The trucks for the Union Pacific Class B-24 lightweight box car are double-truss spring plankless type with 5½-in. by 10-in. journals. The side frames and bolsters are made of high-tensile cast steel. Trucks are equipped with plain hard cast-iron side bearing; Creco No. 3 brake beams, flexible supports, sliding chairs and bottom rod guards; Schaefer brake hangers, wear plates and lightweight bottom rods. The trucks are equipped with bolster snubber springs and have one-wear wrought-steel wheels.

The underframes, fabricated by the Mt. Vernon Car Company, Mt. Vernon, Ill., are of welded construction with A. A. R. Z-section center sills of copper-bearing





Left, top to bottom: Assembling a truck; setting an underframe on the trucks; applying a car end with the shop crane; putting up the air-brake equipment—Above: Jig used with a gantry crane for handling a side panel

open-hearth steel; all other parts of the underframe are of low-alloy high-tensile steel. Four floor supports are provided instead of the conventional two, in order to give stronger floor support for concentrated loads. The floor supports extend from bolster to bolster. The coupler striker and carrier are built-up welded constuction; front draft lugs are forged steel, welded to the center sill. The combined center filler and rear draft lugs are high-tensile cast steel, riveted to the underframe. Center plates are made of forged steel, riveted and welded to the underframe.

The superstructure is of riveted construction, using both copper-bearing open-hearth steel and low-alloy high-tensile steel and is similar to the A. A. R. design with slight modifications. Low-alloy high-tensile steel is used for the side sills, side posts, door posts, W-section corner posts and Dreadnaught steel ends. The intermediate side sheets are .067 in. thick, made of low-alloy high-tensile steel. The side plate is a Yoder Mill section of copper-bearing open-hearth steel. A departure from the conventional construction is the use of end side sheets of greater thickness than the intermediate side sheets and the addition of furring-post angles which extend from the side sill to side plate. The end side sheets are .10 in. copper-bearing O. H. steel and furring-

Below: Applying the Douglas fir plywood ceiling panels; joints are broken with batten strips

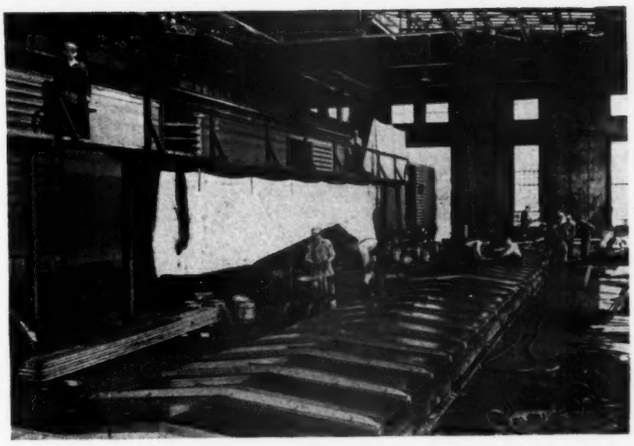
Above: Riveting the car ends

post connections are 2½-in. by 2-in. by ⅛-in. rolled angles. The corrugated ends have large-radius corners which, with the W-section corner-post construction, heavier end side sheets and furring post angles, materially stiffen the car body with little added weight to the car.

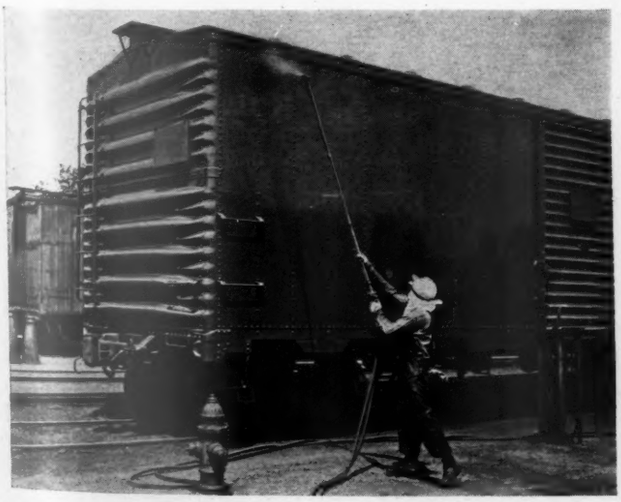
The doors are a corrugated intermediate-weight design, furnished by the Youngstown Steel Door Company with Camel lightweight roller-lift fixtures. Roofs are Murphy improved solid steel, made of low-alloy high-tensile steel.

The cars are equipped with Type-E high-tensile cast-steel couplers, bottom operated by Imperial rotary coupler release rigging. The cars are also equipped with the Union Metal Products Company's coupler centering device, Type AB brakes and various makes of vertical-wheel high-power hand brakes. All hand brakes are provided with oil holes for oiling the internal working parts. Lightweight high-tensile cast-steel vertical coupler yokes are used with various makes of certified draft gears. All small forgings are manufactured in the railroad company's shops.

The car interiors are completely lined with wood. The floor is 1¾ in. thick, with Philippine mahogany used in



Right, top to bottom: Driving carrier iron rivets; assembling car roofs in a special jig; completed roof being lifted by the shop crane and being applied to one of the cars; jacking the floor boards tight preparatory to applying the keyboard—Below: Spray painting one of the 50-ton box cars



the doorways and Douglas fir in the balance of the car. The sides and ends are lined with $^{25}/_{32}$-in. Douglas fir. The ceiling is lined with $^{5}/_{16}$-in. Douglas fir plywood panels which are secured to the roof at the roof joints by metal strips. Plywood strips cover all roof joints and side plates so that the only exposed metal surfaces on the inside of the car are the doors.

Progressive System Used in Building Cars

The cars are assembled, using the progressive spot system, whereby specialized gangs supplied with necessary tools and materials, perform all major operations at specified positions as the cars advance along the assembly lines. Trucks are assembled under a small gantry crane at one end of the erecting shop, special lifting hooks and chains being designed for most efficient use with this particular type of truck. A hand-operated chain hoist is used to support the bolster, and two quick-acting air hoists save time in lifting the side frames.

In the next position, the underframe is removed from the flat car on which it is shipped from the builder and placed with the shop crane on a jig in which the draft gears and yokes are previously assembled. Simply dropping the underframe thus slips the draft gears and yokes into place without an extra operation. These parts are temporarily keyed in position while the underframe is placed on the trucks, after which the previously assembled steel ends are put in place with the shop crane. The couplers are also placed by the crane with a special lifting hook, which saves time and is much safer than the method formerly used.

The air cylinder, reservoir and AB valve are next applied, and then the air-brake piping which is extra-strong steel. Pipe sections are cut and bent in advance in the pipe shop, and are blown out with compressed air to assure the elimination of all loose dirt and scale. At this position, the coupler centering device is applied and hand-brake fixtures riveted.

The car then moves out of the shop under a gantry crane where each steel side is applied as a unit. The next position in the shop is devoted to fitting up and reaming, followed by riveting. The gang which rivets the steel ends, ladders, sill steps, and top and bottom corners, remains in one position between two adjacent cars where they can work to best advantage, with all tools, rivet furnace, scaffold, etc., conveniently located.

The exact number of flooring boards required is next loaded in the car and a portable scaffold is placed inside for the roof-riveting gang. While in this position, the top corner connection and push pole pockets are welded to make them weather-proof. The car roof is assembled in a jig on the shop floor and applied to the car, using the shop crane and a long beam with seven points of chain-and-hook connection to the running-board saddles, which enable the roof to be lifted without springing it out of alinement. The floor boards are spread out and the floor laid, being jacked tight and a key-board applied. Holes are bored for the bolts from underneath the car, after which the bolts are applied and nuts tightened from underneath by means of pneumatic wrenches. The bottom door tracks are put in place and welded, the doors applied and fitted.

The next operation is applying the side furring posts and end fillers to which the inside lining is toenailed. Application is then made of the side lining, end lining, plywood ceiling, side and end facia, after which the car is cleaned preparatory to adjusting the side-bearing clearance, testing air brakes, painting and stenciling.

The car is moved outside the shop and given two coats of red synthetic freight-car paint by the spray method. The galvanized roof sheets are primed with a light coat of Stibloy to give a good bonding surface, after which two coats of paint are applied. All steel, as received at the shop, is protected with one coat of chromate base primer. On the interior steel floor supports and side and end walls for a distance of two feet above the floor, an additional coat of car cement is applied to give further protection to both the steel and the wood against moisture.

The Class B-24 box cars are put through the shop on a production basis, individual gangs being changed in size whenever necessary to assure completion of the work at each position at approximately the same time, so that the entire string of cars on each track can be moved at once. The combined average production at the three shops engaged in this car-building program is about 20 cars a day.

Building Up

The Car Inspector*

By Fred Peronto

In times past we know that very little attempt at any kind of a system was ever made to train men for car inspectors' positions, and at some of the larger terminals, particularly in the metropolitan areas where mostly foreign-born carmen were employed, just about anyone who could read and write eventually landed a car inspector's job regardless of how well qualified he happened to be for the position. The limited field from which to choose, of course, made this unavoidable in most cases.

Today, it is somewhat different, for now we have a much larger percentage of carmen on our railroads who can read and write very well and, therefore, with a greater field from which to choose, there is less reason to have unqualified men on the job. And in many cases where we do have them, it is perhaps due to our indifference toward adopting some sort of a system for training and selecting men for the position.

In building up a car inspector we believe that, regardless of the kind of system employed, it should provide him with the proper background and training for developing the following two very important qualities: (1) The ability to detect all possible defects on cars in train yards and in trains; (2) the capacity for using good judgment in deciding whether to shop the loaded car or allow it to go forward, where defects are noted.

* Abstract of a paper presented at the May meeting of the Car Foremen's Association of Chicago. The author is A. A. R. inspector, Chicago & North Western.

There are other necessary qualities to be desired in a car inspector, of course, but none are so important, and if he lacks these two he has no foundation for developing into a successful man.

The ability to detect all possible defects on cars is something that the individual can develop through constant study of weaknesses in various types of equipment. The number of ways by which we can help him in this development, however, are very limited. Outside of coaching him, all that we can in the matter of known weaknesses in various items on certain equipment, perhaps the greatest aid that we have to offer is the encouragement we give in commending him from time to time for locating a particularly dangerous defect that was not easy to find.

But when it comes to a car inspector trying to develop his capacity for using good judgment in shopping cars, there are a number of outside influences to be considered. Here is where his superiors can either be of great help to him or else act as a retarding influence that will keep him constantly confused. Perhaps the two greatest influences on a man's good judgment in shopping cars are the matters of discipline and the kind of a boss that he happens to have.

Fair Discipline and a Good Boss Needed

The relative merits of the various systems of discipline in effect on railroads will not be discussed here, but we will say, in passing, that some form of discipline for actual failure in the performance of our duty is necessary. We do not believe, however, that it should be so severe as to haunt the very lives of our conscientious men. No man can do his work properly, and especially not when it comes to rendering decisions of importance as to the safe movement of a car, with haunting fear of a severe sword of discipline forever hanging over his head. Discipline on a fair basis is neither resented nor feared by any man and we actually believe that car inspectors in general perform their very best under such a system.

We assume that if the average car inspector were in a position to speak his mind freely he would ask us to give him the kind of a boss who always kept both of his feet on the ground, for there is nothing in the world that will rattle a car inspector more quickly than an excitable boss. We also suspect that one of the prayers of some of our car inspectors is for the Lord to rid them of the kind of a boss, directly in charge, who will not stand back of his verbal instructions.

When you really stop to consider, you will note that the Association of American Railroads Code of Rules has given us comparatively few items on railroad cars where definite limits for specified defects have been prescribed for shopping the car. The only really important one where it does, of course, is the item of wheels. Rule 56 tells us when we can remove air hose and Rule 66 specifies when journal bearings can be removed, but we do not have to shop the car to repair either of these items. Rule 63 sets up certain wear limits on brake beams but it also specifically mentions that these limits are not to be used for shopping cars in the train yard but rather on cars passing over the repair tracks. And on couplers only the area in the back wall of Types D and E has been covered in Rule 18; cracks in the shank and in the other parts of the head are left to the judgment of the car inspector. Certain safety-appliance items are covered by the Interstate Commerce Commission laws, as well as are tank-car regulations, but invariably most of these are not concerned with the safe operation of the car in trains.

All rules and regulations are noticeably silent, however, when it comes to condemning limits for such defects as cracks and flaws in truck sides, arch bars, truck bolsters, body bolsters, etc. Loose coupler-yoke rivets, slack drawbars and cracked or worn coupler yokes are left to the judgment of the car inspector. The rules are also silent with respect to the extent that such items as center sills, draft arms and lug castings have to be defective before the car can be shopped and repaired. And yet, the condition of all of these items which we have enumerated is just as important to the safe operation of the car as are the items of wheels and certain safety-appliance defects.

Most Dangerous Defects Left to Car Inspector's Judgment

The difference, however, is that we have been provided with a gage and a set of regulations to handle the one kind, while we have to use our good judgment, such as it is, to cope with the others. The point that we wish to make is that by far the majority of the so-called dangerous defects on the cars are left to the judgment of the car inspector and that is why we wish to emphasize again the fact that it is so important to the well-being of a railroad to have a force of car inspectors who are really capable of exercising good judgment at all times. We know that even in the consideration of wheel defects, many a capable car inspector has been very successful in using his technical knowledge and his good judgment rather than close application of the wheel gage. And on the other hand, we have all observed other men whom we could perhaps term not so successful from a railroad standpoint, who insist on substituting their wheel gage for their better judgment at all times, simply because they have been provided with such an instrument.

One very common failing in our inspection methods a few years ago was to gage the type of inspection on a car according to the importance of the commodity that it carried. If it were a load of livestock or a load of perishable fruit we looked the car over very carefully, indeed, in order that no kind of a defect would get by us. If it happened to be a load of company coal why we just gave the car a casual sort of inspection, and empty cars in general rated about the same kind of a job. In times past I have actually heard inspectors remark when told that there was a train of empty stock cars on hand to be inspected—"Well, it doesn't make much difference

whether these cars get inspected or not. We'll get 'em in a hurry; they're only empty stock cars."

It is still true that, if we miss a defect on an empty car and it has to be set out of a train enroute, the situation is not nearly so serious as it would be were a loaded car involved. However, we have learned that it is also a serious situation where we indifferently overlook defects on empty equipment moving forward to outside points for loading. For when these cars are eventually loaded the existing defects are sure to be found and serious delay to the load may be the result. Therefore, we should all realize that it is mighty important for inspectors to make just as good, or even better, an inspection of empty equipment as they do on loaded cars in order that all defective empties may be switched out and repaired before they are loaded. That is the time to do the job; not after they have been loaded. While we have made much improvement in this respect during the past few years, there is still a lot more that can and ought to be done.

Car Inspectors' Duties Compared, Past and Present

The question has sometimes been raised as to whether or not a car inspector's position is not somewhat easier today than it was twenty years ago and no doubt some very convincing arguments could be presented on either side of the question.

We might state, for example, that there are less weaknesses in the equipment as it exists today than there ever were. When all of our cars had arch-bar trucks the car inspector had to spend a lot of time down on his knees scraping off rusty scale and examining the bends in the arch bars for possible fractures. He had to watch closely for badly worn journal-box and column bolts, for nuts missing on the same items, for sprung arch bars, broken brake-hanger castings and for numerous failures on swing-type truck bolsters and other earlier types of built-up bolsters.

And when we handled mostly wooden underframe equipment he always had to be on the look-out for split center sills, broken end sills, split and broken draft timbers, broken draft bolts, broken lug bolts, broken body truss rods, defective queen posts and a lot of other underframe items on the car. Rule 44 combinations, too, were very numerous on the old wooden under-frame equipment and inspectors at interchange points used to perform a lot of acrobatic stunts crawling around under the cars to detect possible sill failures.

Getting up a little higher on the car, we used to find a lot of side doors swinging out of the guides or off the track or bulged out so badly that they were about ready to drop off. Running-board saddles were secured only by screws and they were continually becoming loose, letting the whole running board swing loose out over the side of the car. Numerous car ends were found either broken or forced out, which invariably caused insufficient safety appliance clearances or else outright defective safety appliance.

And didn't we have fun during the grain season! It was quite a job to keep the body of a wooden car boxed up tightly at all times in the good old days and so we used to have a lot of grain leaks. They were the headache of every car inspector who ever handled cars during the old grain seasons. He didn't exactly like to put a bad-order card on every car so he spent a lot of time and energy coopering up hundreds of leaks with burlap, paper, scrap lumber or what have you.

Periodic journal-box repacking and attention was not followed out very closely twenty years ago and so the inspector always had a lot of hot boxes to contend with. There were also a lot more cars with defective air brakes resulting in a lot more flat wheels. Car wheels, too, were not so well made and, therefore, developed more failures that had to be watched very closely.

And so we have the picture of a car inspector of twenty years ago as being a pretty busy man; and on top of all of this, he necessarily had to write out a lot of bad-order cards and enter a lot of bad-order records in his books. During winter weather in colder climates this outside book work was anything but a pleasant task.

And what is the picture today? Perhaps a real old-timer could explain the situation much better than I can for he has worked faithfully along with the change from the old to the new and he fully appreciates all that has taken place along the way.

We might begin by saying that with the passing of the arch bar our present type of trucks under our cars develop comparatively few defects. Solid truck sides and solid truck bolsters develop but few fractures that are really dangerous. In some trucks, spring planks have been eliminated entirely, leaving one less item to be watched. Rules permit the renewal of many brake-rigging items for worn conditions, where they did not in the past, and consequently these items are being maintained in much better shape under our present cars. This, too, relieves the car inspector of closely examining a lot less of these badly worn items and rendering his decision thereon. A lot more cars of today carry auxiliary brake-beam and bottom-rod supports to protect brake-rigging failures and it is not nearly so common a sight around a railroad yard as it used to be to see car inspectors pulling a lot of mangled brake rigging items out from under a car.

And with our present steel-underframe equipment, how many cars do we find with Rule 44 combinations? Center sills, draft sills, or end sills seldom fail all at once, and not so many fractures develop, either, and those that do are ordinarily not so hard to find. We all know that the underframes on our present cars do not have so many weak points to be watched.

Passing from the underframe to the body of our present cars, we find either an all-steel or else a reinforced side door that does not bulge out easily, and is seldom in such shape that it can be forced out. And with well secured door tracks and an improved type of door fixtures, doors seldom get off the track or out of the guides or become lost off the car. Running-board saddles and running boards are now mostly secured with bolts so we have less running boards to become loose and sideswipe passing trains. Side fascias, too, what few are left, are mainly secured with bolts, and with most of our cars carrying metal roofs, there are fewer wooden-roof cars to be watched that develop loose roof boards, another very common sideswiping menace in the old days.

And so it naturally follows that the car inspector of today applies a lot less bad-order cards on cars and, therefore, in those same cold climates that we mentioned before he probably has a much better chance of keeping his hands warm.

In making the above comparisons of the old with the new we do not wish to detract in any way the credit that is justly due our present force of men. The car inspector of today looks over his cars just as closely as he ever did—in fact, he looks even more closely—but taken as a whole the number of existing defects and weaknesses to be found on our present cars has dwindled down considerably. Therefore, it naturally follows that less time is required for actual inspection of the car. And, by the same token, inspectors do not find it necessary to perform so many light repair jobs to keep the cars moving.

Modern High Speeds Introduce Inspection Problems

High speed, however, is one operating condition with which the present car inspector has to contend that he did not have in the past. Any failure under present operating speed would be likely to cause more damage than it would have in the past with slower trains and, therefore, he has to be more careful in his inspection. Delays, too, especially where due to such common failures as hot boxes and the like, are not tolerated in the same manner as they were in the past and, therefore, he has to do a better job of inspecting and servicing his cars in order to avoid them.

The evolution in car-building standards has taken away some of the necessity for constant inspection of many of the details of our equipment, and, along with it, perhaps, some of the prestige of that old equipment watchdog—the car inspector. However, the wise car inspector of today is proving his worth and is fighting to gain even more prestige by his efforts to render additional service on the job. And so we find him doing a better job of service-treating his journal boxes, a better job of examining his journal bearings to detect worn conditions and waste grabs, and thus he helps to cut down the hot boxes. We find him making a closer inspection of brake-rigging parts and spending all the time that the job will allow him in replacing worn and defective cotter keys and connection pins and brake-shoes and keys. And here again he eliminates the danger of many a brake-beam failure. He carefully checks his train line and his air hose items and, under the terms of the A. A. R. rules, removes defective air hose from cars before they get deteriorated to the point where they will surely blow out while in a fast train and thus cause serious trouble. In short, he is applying himself more closely to the old fundamentals of his job and at the same time seeking new details of service that will benefit his company. And just so long as enough men in our ranks are moving in this direction we need have no fear of the future of the car inspector—he'll always be an important and a welcome part of our railroad operation.

We sometimes wonder who invented that old legend about the car inspector who, when he was asked why he went around the car with a hammer and tapped the wheels, shook his head and replied that he had been doing it for thirty years because he had been told to, but didn't know why. However, we do suspect that the inspiration for the yarn came from someone watching the listless performance of some of our car inspectors in those days. The picture of a man mechanically wandering along a string of cars looking rather indifferently at parts of a car now and then used to be quite common indeed.

It is much more refreshing to observe the car inspector of today as he passes alertly along his trains in the yard, carefully opening each journal-box lid and peering in on both sides of the journal to determine the condition of the journal bearings and the packing, and eagerly watchful for other defects on the car that might cause trouble. He is armed with the knowledge for handling his job that he has gained from his own experiences, and from a careful study of the existing rules and instructions. Therefore, he knows just what to do at all times and he is confident that his job is very important insofar as the safe operation of trains is concerned.

In many instance car departments in the early days on railroads failed to gain much in the way of respect from outsiders or even from railroaders outside of their own particular department. Contacts with some of our early wheel tapping type of car inspectors may have been partly responsible for this. We hope that we have lived down that picture by this time. But we must remember that an intelligent group of willing workers, thoroughly versed in all matters pertaining to their job, is bound to command respect from everyone, including themselves.

The Car Inspector as a Railroad Representative

We should all realize that the car inspector comes in contact with others outside of his own department perhaps more frequently than any of us. He works daily with switch crews and train crews in handling his trains. Yard clerks and even yardmasters often get a lot of their detail information from him. He deals directly with the local agent in many cases where he furnishes perishable freight protection or handles seal records. In addition to this, he is often sent out to local industries to measure high and wide loads for clearances, to instruct shippers how to block an open-top load or to inspect one after it has been loaded. He goes to manufacturing plants to inspect cars just unloaded to see if they are fit for reloading. And he is even called upon to make inspection of cars at unloading platforms where lading is damaged due to the physical condition of the car. This group of men, including the outsiders whom he contacts at the industrial plants, are bound to be greatly influenced in their opinion of our department through their dealing with the car inspector. Therefore, he is indeed in a position to do his department, and even his railroad, a lot of good. If he presents a good appearance and conducts himself in a businesslike manner and is eager to be of assistance at all times and can furnish valuable information, or can intelligently answer questions with reference to his end of the railroad game, then we can truly say that we have an ambassador who is building up a lot of good will towards his department, along with his daily work. And if he fails in all of these points he does not properly represent his department.

In the foregoing remarks we have attempted to indicate the need for building up the car inspector, for his position is of great importance in the handling of all cars. Anything that can be done to further his development should not be overlooked.

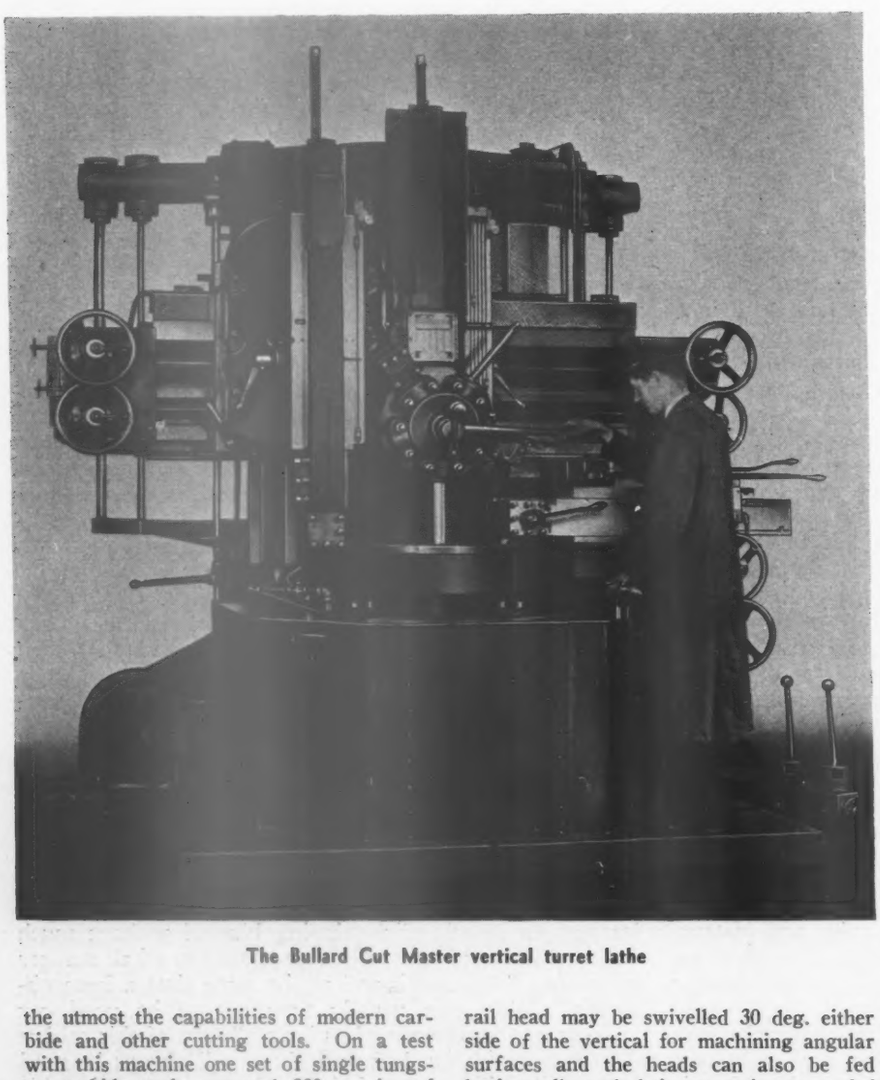
Some roads broadcast questions to their inspectors periodically pertaining to current rules and regulations. In seeking out the information to answer these questions the men are likely to become quite well versed on all such references. Another practice which we have noted is to broadcast useful information on the handling of important matters quite frequently by means of circular letters. Other railroads see to it that education and training is imparted to their inspectors first-hand by their immediate supervisors and by their field men. All of these methods are helpful to the inspector, but they are of little use unless the individual, himself, is willing to accept in the proper spirit the chances that are offered for his development. As a whole, however, it is most gratifying to note the eagerness with which most inspectors will accept first-hand training and information on how to handle their job, once they are satisfied that a sincere and honest effort is being made to help them.

Occasionally a man may be found who seems to have learned the knack of developing himself without much outside help. He is usually a good student of all matters pertaining to his work and at the same time a keen observer. Such men usually turn out to be good car inspectors. Since none of us have all men of this calibre in our organization, however, there will always be need for training our men and those of us who practice this diligently are bound to be rewarded in the end by a first-class force of car inspectors who are indeed a credit to the railroad.

NEW SHOP TOOLS AND EQUIPMENT

Vertical Turret Lathe

The Cut Master vertical turret lathe is one of the latest achievements of the Bullard Company, Bridegport, Conn. This new line of machines is built in 30-, 36-, 42-, 54-, and 64-in. table sizes. They are designed with a wide range of feeds and speeds and the ability to stand up under high-horsepower loads in order to utilize to the utmost the capabilities of modern carbide and other cutting tools. On a test with this machine one set of single tungsten-carbide tools removed 220 cu. in. of cast iron per minute.



The Bullard Cut Master vertical turret lathe

The 30-in. and 36-in. machines are designed for two heads, a main turret head and a side head, while the 42-in., 54-in. and 64-in. machines carry three heads, a left-hand main ram head, a right-hand main turret head, and the side head. However, any choice of heads are available to meet individual requirements. All the heads and functions of the machine are protected by interlocking and limit switches so that it is almost an impossibility to damage the machine through forgetfulness or careless handling. Either rail head may be swivelled 30 deg. either side of the vertical for machining angular surfaces and the heads can also be fed horizontally and their respective rams fed vertically at the same time for machining any angles up to 45 deg. Further, if the main heads are set at angles varying up to 30 deg. off the vertical center, angles ranging up to 60 deg. may be produced. The two main heads have screw feed, both horizontal and vertical, which assures extreme accuracy, smoothness of movement, and a fine finish for the work in process.

The traverse and feed control are combined in one lever in the center of each handwheel, one lever for the turret slide and another for the saddle movements and this arrangement has simplified these operating functions. With this design there is a natural interlock which prevents the feed and the traverse from being engaged at the same time. However, feed of the slides does not prevent rapid traverse of the saddles or vice versa. The power traverse control is sensitive in action and produces rapid, individual, and simultaneous action for vertical or horizontal movement of both main saddles and rams as well as the side head and its ram. Each head has its own feed mechanism which functions irrespective of the others and feed changes are quickly made without stopping the machine or removing the heads from the work. There are 16 feeds and 20 speeds, all in geometric ratio.

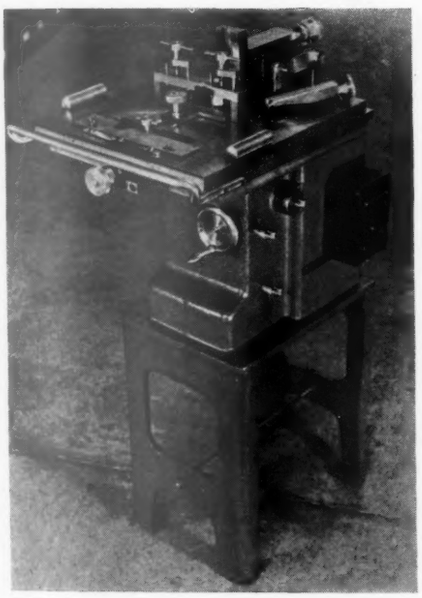
Electric stops are furnished for feeds of all the heads in any direction and they provide a feed stop-off when approaching finished dimensions. The moving members are equipped with fixed switches which contact the adjustable trip dogs at any desired setting. This action closes the circuit, thereby reacting on thrustors which, in turn, disengage the feed. On the turret head there is a selector bar which permits the use of separate trip dogs for each station of the turret. As the turret is indexed, the selector bar moves to each respective position. Trip dogs are easily adjusted, and when set for their respective dimensions they assist in the duplication of these dimensions.

It is possible to operate these machines at the higher speeds because of the large Timken-bearing spindle mountings. Antifriction bearings at other points and the positive-pressure filtered lubrication throughout the machine assure long life with a minimum maintenance cost even under the heavy cutting or the higher speeds to which these machines can be subjected. Chucks of a new design minimize the friction within the mechanism thereby providing maximum jaw pressure with minimum turning effort of the wrench. They may be had in a three-jaw universal or four-jaw independent type having conventional T-slots.

The 30-in. and 36-in. machines have 30-hp. motors while the larger machines have 40-hp. motors. The motor drive may be either floor mounted or side-bracket mounted for V-belt drive.

Contour Grinder for Tread-Turning Tools

For many years the turning tools for locomotive tires and car wheels produced by the Gorham Tool Company, Detroit, Mich., have been ground on special contour grinders as a final manufacturing operation. These grinders have made possible the economical production of ground form tools that have extremely accurate contours and the correct clearances for cutting. After many requests from customers for equipment to resharpen these tools in their own shops, this company is offering a simplified machine that permits the easy sharpening of contour turning tools in wheel shops without the need for a skilled grinder operator or expensive equipment.



Gorham contour grinder for locomotive tire and car-wheel turning tools

The machine consists of a solid base enclosing a motor and a vertical grinding spindle. The spindle carries a chuck at the upper end in which a mounted grinding wheel is held in working relation to a turning tool clamped to the work table. The work table is given free motion in any direction in a horizontal plane by rolling on steel balls running in raceways at right angles to each other between the work plate and the intermediate plate and between the intermediate plate and the base plate. The path of the work plate is controlled by maintaining contact between a gage of the desired contour and a revolving cylindrical follower. The depth of the grinding cut is adjusted by means of a hand wheel at the front of the machine which changes the relation of the follower to the grinding wheel and permits the operator to regulate the stock removal within very close limits. A wheel-dressing attachment is built into the machine and a gaging device is furnished which locates correctly the spindle height for the varying tool heights.

The motor for driving the spindle, balanced especially for this application, delivers ¼ hp. and is available in any standard a.c. or d.c. voltage. The spindle is driven by a single V-belt running in three step cones to provide a range of spindle speeds for roughing and finishing. A special Parker ball-bearing spindle is used with vertical adjustments made by rotating a hand wheel on the side of the machine base. The motor and spindle need no adjustment or care other than the specified lubrication.

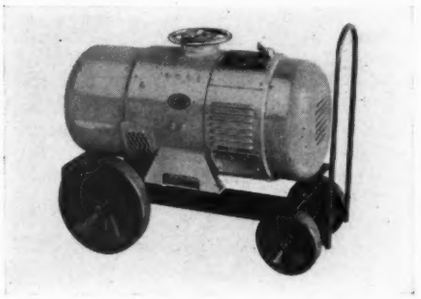
The most unusual feature of this grinder is the use of a conical grinding wheel mounted on a straight steel shank which, in operation, is clamped in a chuck seating in a taper hole in the top end of the spindle. The manufacturer recommends the use of a 12-deg. included angle on the wheel which gives a 6-deg. clearance down from the contour on the cutting edge of the turning tool. Although the dressing equipment is regularly furnished to dress for a 6-deg. clearance, it can be altered to suit individual preferences. The contour gages are furnished as standard equipment, one for the 1-in. A. A. R. tread contour and one for the 1⅛-in. A. A. R. tread contour. Gages for special contours are available as extra equipment.

The operation of the machine is very simple and does not require skill or training. The operator dresses the wheel and clamps the desired contour gage in place on the work table. Then with hand screws he clamps the tool to be sharpened in place under a bridge spanning the work table. With a gage he adjusts the spindle height to suit the tool being sharpened. The motor is then started and the entire work table is guided back and forth across the width of the tool. The operator leans against a bar fastened to the work table when extra pressure is needed. Each time the tool is fed into the wheel, the entire contour is ground back the amount of the feed until all nicks are removed and a perfect contour is produced on the cutting edge. Tools ground on the contour grinder not only turn perfect contours but have a regular clearance along the entire tool which gives an optimum cutting performance.

Single-Operator Electric Arc Welder

Adjustment of the single handwheel located on top of the Wilson "Hornet" welding machine permits the operator to obtain an infinite number of current settings. Directly inside the handwheel is a dial on which the ampere graduations are plainly marked and a revolving pointer indicates the current value for which the handwheel has been set by the operator. The dial markings are so accurately calibrated that meters are not required.

The single-pole control assures a current output that will not vary, resulting in a constant, uniform arc at all times. It is impossible to reverse the polarity accidentally because the electrical circuit is so designed that only a small snap switch on top of the machine will change the polarity of the machine.



The Wilson "Hornet" electric arc-welder

The "Hornet" is a two-bearing unit with the motor rotor and the generator armature mounted on a common shaft. Adequate ventilation is furnished by propeller blades attached to the revolving shaft which draw air in at both ends of the machine and expel it downward at the center. Although shielded-arc electrodes are recommended the machine will operate with equal efficiency if bare electrodes are used.

The machine is supplied in three sizes—Frame BA 200, Frame BA 300, and Frame BA 400, rated at 200, 300 and 400 amp., respectively. This single-operator motor-generator arc welder has just been announced by the Wilson Welder & Metals Company, Inc., New York.

Steam Guns For Cleaning Work

The Oakite solution-lifting steam guns, models No. 384 and 385, will lift a cleaning solution to a working height of about 12 ft. without the use of a pressure tank, pump, or elevated solution tank and thus

Cleaning locomotive motion work with the Oakite solution-lifting model No. 385 steam gun

eliminates the need or the expense of this accessory equipment. The cleaning solution may be drawn from a pail, an open drum or other container. The model No. 384 operates from a steam supply with a pressure of 30 to 80 lb. per sq. in. while the model No. 385 requires a steam pressure of 60 or more lb. per sq. in.

The model No. 385 steam gun is shown in the illustration cleaning the motion work of a locomotive. It has a length of 7½ ft. and weighs 13¼ lb. Seamless-steel tubing and castings of brass or aluminum are used in its construction. This steam gun has a single seamless-steel nozzle with 15/16 in. inside diameter as it is designed only for heavy steam-cleaning operations. The two circular rubber-covered handles are said to balance the gun perfectly when steam is flowing from the nozzle.

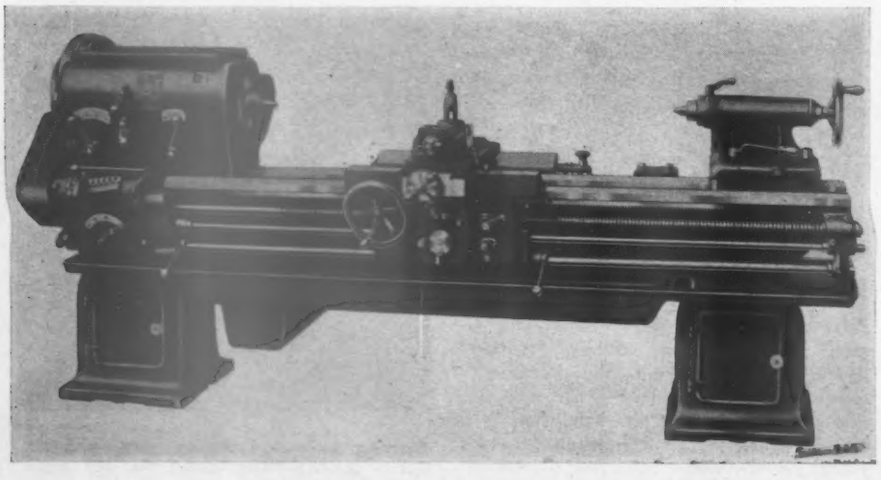
The smaller steam gun, model No. 384, has a length of 3½ ft. and weighs 5¾ lb. It is of the same general construction as the larger gun but is equipped with two sizes of nozzles and suction orifices to provide smaller or larger quantities of cleaning solution depending upon the steam capacity available. The handle of this gun is constructed with hardwood spindles mounted on aluminum spacers and held by strong clamps in order to keep the handle air-cooled.

Both models are equipped with solution valves and steam valves and a strainer for the solution hose. The larger model was developed for the cleaning operations in connection with the maintenance and repair of locomotives and rolling stock, while the smaller model is suitable for cleaning floors, freight-car interiors, and small equipment and parts. The steam guns are made by Oakite Products, Inc., New York.

Heavy-Duty Lathes Have Speed Selector

The LeBlond Super Regal line includes the 21-in. and 24-in. heavy-duty lathes in addition to the 13-, 15-, 17-, and 19-in. lathes and the 10-in. Regal lathe. One of the new features on all but the 21-in. and 24-in. Super Regal machine is the speed selector built into the headstock with a dial to show the cutting speed for commonly machined materials and to indicate the revolutions per minute for the proper cutting speed. Eight spindle speeds are obtained through heat-treated and hardened sliding gears. The final drive is through helical gears which give strength to the gear train and a smooth, powerful drive to the spindle.

A direct motor control or multiple-disc clutch and brake is furnished on the 21-in. and 24-in. lathes where frequent and rapid stop and start is required. A lead screw and feed rod are now built in all these lathes. A single-point adjustment is of such a design that the plates can be adjusted to as little as .003 in. which gives maximum capacity with minimum pressure on the operating lever. The lathes are made by the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio.



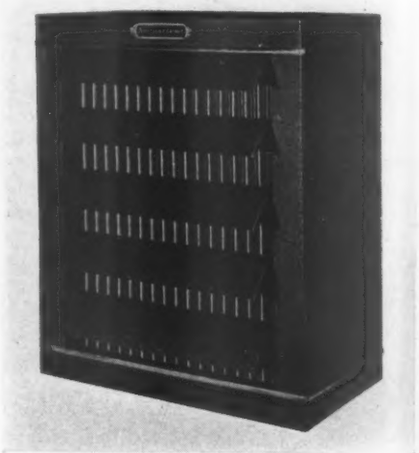
The LeBlond 21-in. Super Regal lathe

High-and Low-Velocity Unit Heaters

The Venturafin unit heaters made by the American Blower Corporation, Detroit, Mich., are available for either high or low air-velocity operation. The high-velocity heater is for use in large rooms with high ceilings which are difficult to heat. The low-velocity heaters are available for rooms requiring quiet operation. All sizes of heaters are rated for sound which makes it possible to select a heater with a sound rating for a particular sound level.

The heaters have a streamline air inlet which reduces power consumption and lowers the operating cost. The epicycloidal-propeller fan is the result of a constant endeavor to produce a wheel which would handle more air with a minimum power requirement. All the coil headers are of cast-bronze "steam metal" and are designed for a maximum steam pressure of 150 lb. per sq. in. The tubing is of extra heavy seamless copper, airfoil in shape, and designed to give the maximum heat transfer with the least resistance to air flow. The relation of the fin area to the tube area in the sheet-copper fin stock is of the proper proportion to give a maximum transfer of heat.

The logarithmic-curved louvres are die formed and individually adjustable, which permits the heated air to be deflected at any angle. All motors on these heaters are totally enclosed and are especially designed for unit-heater duty with thrust and wool-packed sleeve bearings. Standard motors are designed for operation in 125-deg. maximum air temperature and special motors are required for operation in higher temperatures. The motor bracket support is designed to present the least resistance to the flow of air.



American Blower Company's Venturafin unit heater

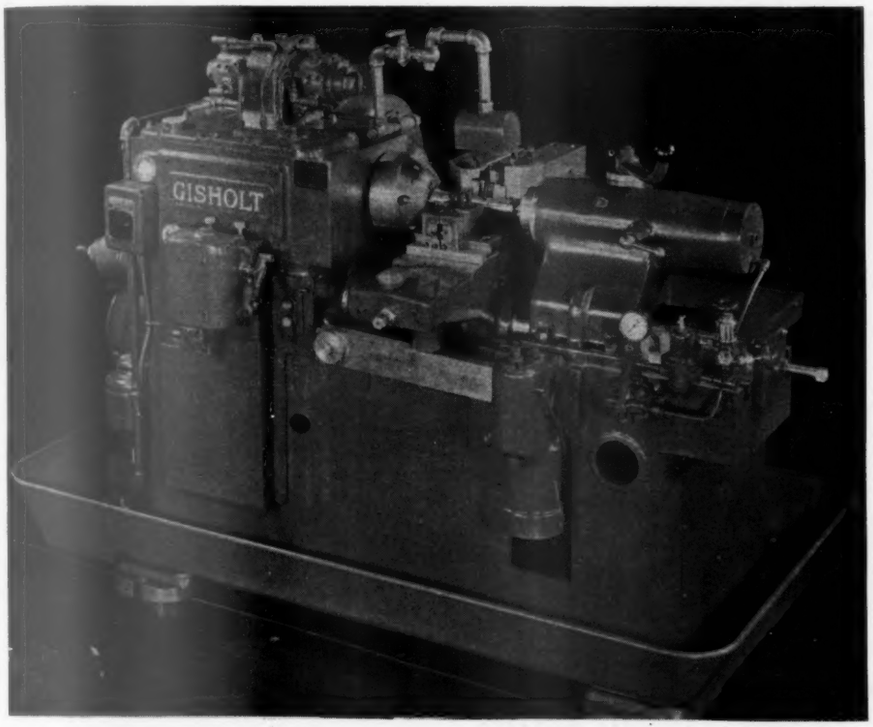
Lift-Platform Industrial Truck

The GEP-6 lift-platform truck for handling material on skids is one of the new power industrial trucks built by the Elwell-Parker Electric Company, Cleveland, Ohio. It has speeds up to 10 m.p.h. and a rated capacity of 6,000 lb. The heavy-duty industrial type four-cylinder motor develops 33 brake horsepower at a normal speed of 1,250 r.p.m. This truck has many safety features and is built under the Underwriters' Laboratory re-examination service.

The Elwell-Parker GEP-6 lift-platform truck

Hydraulic Automatic Lathe

The Gisholt No. 12 lathe is automatic in its operation. The only requirement of the operator is to place the work in the machine and pull the control lever to start the lathe. It is adaptable to a wide range of applications including between-centers, arbor, and chucking work or for jobs that must be handled in fixtures. It is ideal for high-production manufacturing, yet, due to its flexibility and the ease with which it can be changed from one job to another, it is well adapted to manufacturing a variety of parts even in small lots. The machine is made by the Gisholt Machine Company, Madison, Wis.



The Gisholt No. 12 hydraulic automatic lathe equipped with single-lever operated tailstock with air clamp

The adaptability of the machine to a wide range of work and the ease of change-over from job to job are due largely to the means by which the slide motion is obtained and to the unusual method of controlling the machine functions. The tool-carrying slides receive power for their motion through fluid pressure acting on the slide pistons. A large-volume gear pump furnishes the fluid power for rapidly traversing the slides and individual plunger-type pumps provide accurately metered quantities of fluid for advancing both the front and rear slides at the desired rates of feed.

Shifting the control lever upward causes the spindle to rotate and the slide to advance rapidly to the work piece. When the tools reach the proper position, the slide pistons encounter adjustable, positive, traverse stops and instantly the rapid rise in the fluid pressure is transmitted to the central control valve which automatically shifts the control lever to the feed position. The control of the feeding motion by abutment against dead stops insures precision and exact duplication of machined dimensions. At the end of the cutting stroke when the dead stop is encountered and further movement is arrested, the continued delivery from the feed pump increases the fluid pressure which automatically shifts the hydraulic control valve to the rapid-return position. The slight dwell against the stop while the pressure builds up tends to relieve the strain in the work piece and to permit the tool to cut free. During the rapid return of the slide to the starting position the spindle clutch is disengaged and the brake is applied. At the completion of the return motion the control lever is automatically shifted to the stop position.

Since the hydraulic power for actuating the control of the slide functions is transmitted by the same fluid pressure that supplies the power for the slide motion, the adjustment of traverse and feed trips is merely a matter of loosening, setting, and locking ordinary stop screws. The range of action, the location, and the direction of motion of the slides can be easily varied between wide limits. The bed and headstock of the Gisholt No. 12 automatic lathe are of one rigid nickel semi-steel casting.

Face Grinder With Centralized Control

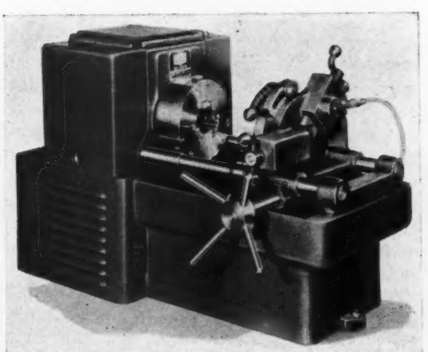
On the older design of face grinders, built by the Bridgeport Safety Emery Wheel Co., Inc., Bridgeport, Conn., it was necessary to go to the front of the machine in order to set the dogs for controlling the length of the carriage travel. On the improved machines all of the control levers are placed at the rear of the machine and are readily accessible to the operator.

The face grinder of the Bridgeport Safety Emery Wheel Co. with centralized control

The length of the carriage travel is controlled by the dogs on the dial at the operator's position. It is a simple matter to jump one of the regular dogs by depressing a foot treadle in order to bring the carriage out into the loading position. Any carriage speed from 5 to 90 ft. per minute is obtainable on this machine.

Pipe Machine With New Die-Head Design

The "Tom Thumb" pipe machine, known as the No. 562, has the capacity to handle all sizes of pipe from ½ in. to 2 in., inclusive, through its spindle and is also capable of driving geared die stocks up to 8-in. capacity by means of a special, universal shaft. The spindle, worm drive, and all shafts are mounted in ball bearings. It has a welded steel base and guards which give it maximum strength with minimum weight. The machine is powered by a ½-hp. Black & Decker, universal, reversible, variable-speed motor and the drive from the motor to the machine is through V-belts.



The Oster No. 562A "Tom Thumb" portable pipe machine

A new design of die-head which is integral with its carriage is used for greater rigidity and support for the high-speed threading dies. This die head tends to lengthen the life of the dies and to produce more accurate work. The front-

cutting die-head, together with the machine's "close-grip" front chuck, permits pipe lengths as short as 2½ in. to be threaded without the use of a nipple chuck. The size-setting marks are on top of the die head where they are plainly visible for easier, more accurate settings. The ways on which the head is mounted are 1¼-in. solid-steel studs supported at both ends for perfect alignment.

The "Tom Thumb" pipe machine is equipped with a built-in, cut-off attachment that is operated by a ball crank handle and opposed by a V-block steady-rest to take the thrust of the tool and prevent breakage by "hogging-in". A combination reaming and chamfering forming tool, mounted on the cut-off block, does both operations simultaneously.

An internal oiling system to the dies and cut-off tool is furnished. A flexible hose carries the oil from the pump to the intake valve in the head and the flow of oil is controlled by a two-way thumb valve conveniently located for the operator. The No. 562 machine is 23¼ in. high, 23 in. wide, 36 in. long, and has a net weight of 450 lb. The machine is made by the Oster Manufacturing Co., Cleveland, Ohio.

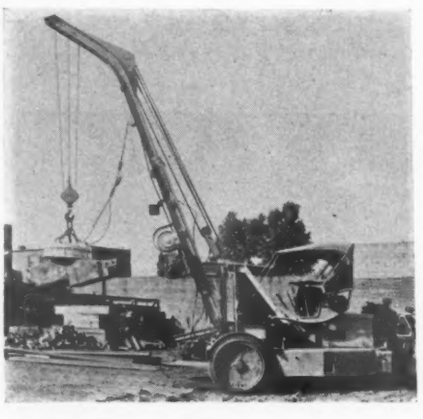
Tractor Crane and Auxiliary Equipment

The Krane Kar is now furnished with magnets and buckets to make it available for other than the ordinary hook work of lifting and transporting materials. The model A Krane Kar is equipped with a 20- and 25-in. magnet, and the model AX Krane Kar is available with a 20-, 25-, and 29-in. magnet. A clamshell bucket may be had with either of these models.

A gas-electric generator, mounted integral with the chassis, and a magnetic panel, master switch and automatic cable retriever with power-feed cable are the auxiliary equipment needed for magnet work. These are provided complete and ready for operation. A special quick-disconnect coupler is between the power line and the power lead of the magnet. The changeover from hook to magnet work requires only a few minutes and can be made by the regular crane operator.

The two-power-line, self-reeving clamshell bucket of ⅜-yd. capacity is intended for clean-up work and light digging. An auxiliary drum operates the holding line and the regular hook winch operates the hoisting and closing line. A tag line attachment prevents the bucket from spinning. It is possible to have the Krane Kar models, A and AX, equipped to accommodate both the bucket and the magnet.

The model A has a lifting and transporting capacity of 5,000 lb. and model AX a capacity of 10,000 lb., both at a 5-ft. radius and 3½ ft. clear from the front bumper. Power for the crane and for propelling the chassis is obtained from one gasoline engine having starting and electric-light equipment. Three worm-gear units are standard equipment for hoisting, swinging and topping, independently or simultaneously, with the maximum load on the hook. The chassis ordinarily has four speeds ahead and one reverse but can be furnished with a directional reverse-gear transmission having four speeds in both directions. This tractor crane is now better equipped for a greater variety of material-handling applications in railroad work with the magnets and bucket in combination with the previous accessories, comprising an auxiliary gypsy winch and the standardized telescopic boom. The Krane Kar is built by the Silent Hoist Winch & Crane Co., Brooklyn, N. Y.



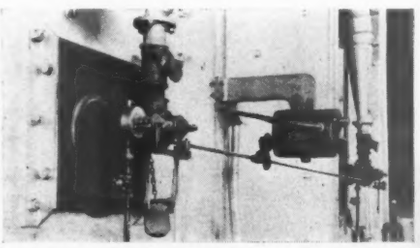
The Krane Kar handling material with the magnet

Oil Burner Maintains Correct Air-Oil Ratio

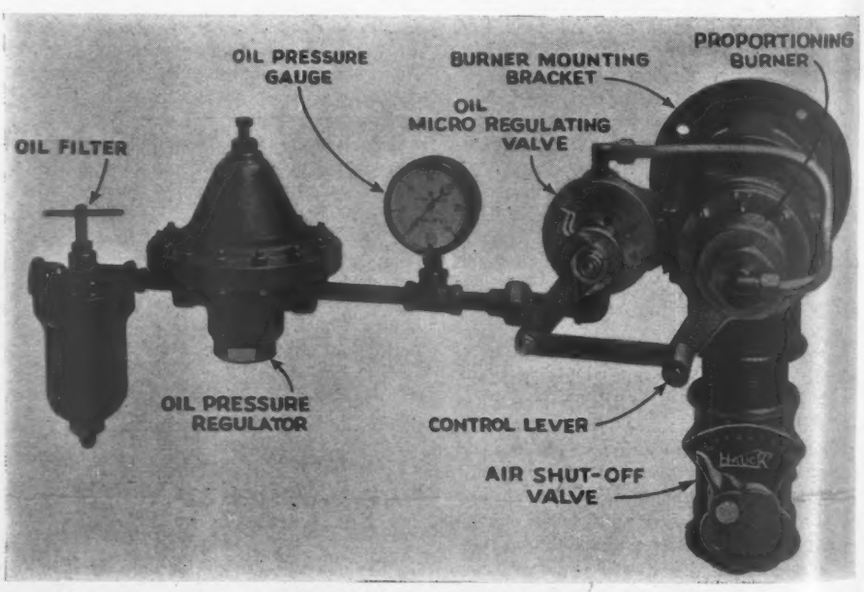
The proportioning oil burner, developed by the Hauck Manufacturing Company, Brooklyn, N. Y., automatically proportions and maintains the correct and straight-line air-oil ratio from its minimum to maximum capacity. The moving of a single lever automatically controls the oil and air supply and simultaneously adjusts both the primary and secondary air orifices in the burner. Any desired air-oil ratio, once set, is automatically maintained thereafter.

As shown in the illustration, the proportioning oil burner consists of the burner with the mounting bracket and air shut-off valve, a micro oil-regulating valve connected through linkage with the burner, and an oil-pressure gage, oil-pressure regulator and oil filter in the oil line to the burner. The air is controlled by the burner-nozzle orifices and, therefore, the maximum atomizing air pressure and constant air velocity are maintained where the oil it atomized. This eliminates reduced air pressure and velocity at the point of oil atomization when the burner is turned down.

Operating tests show that a straight-line proportioning of the air and oil flow is obtained at all dial settings of the burner and that a constant air pressure is maintained throughout the entire range of operation. This is accomplished by connecting together through levers of equal radius a straight-line flow air control in the burner nozzle and a straight-line flow oil valve mounted in the burner. Advancing or retarding the oil valve with respect to the air control changes the air-oil ratio. Once these adjustments are made, then moving the operating lever increases or decreases together the flow of



Installation of Hauck proportioning oil burners with motor control in a normalizing furnace at the Roanoke shops of the Norfolk & Western



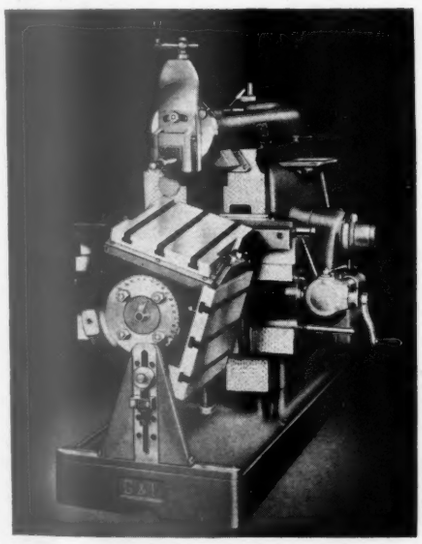
The Hauck proportioning oil burner

air and oil through the burner and maintains the set air-oil ratio over the entire range of the burner. These characteristics make the burner ideally suited to automatic control. Without any change in piping the burner can be connected to a control motor actuated by a pyrometer. A battery of burners can be regulated from one control motor and as each burner is its own individual air and oil mixer it does not affect the other burners in the group. An accompanying illustration shows an installation of these burners with one control motor regulating the burners.

The proportioning burner eliminates the necessity of relying on operators in various shifts to get the correct burner adjustment by regulating separate air and oil valves. They can be installed in any kind of furnace, oven, or kiln.

Universal Shaper For the Toolroom

The 16-in. tool-room universal shaper is one of the latest lines of tool-room and industrial shapers offered by Gould & Eberhardt, Irvington, N. J. The tool-room shapers are high-speed machines



The Gould & Eberhardt 16-in. tool-room universal shaper

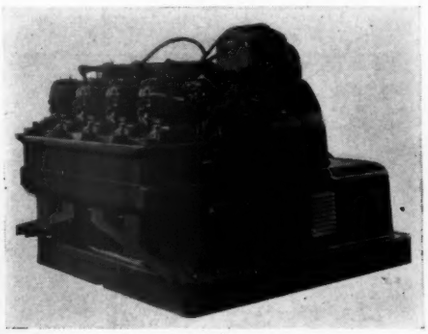
making up to 200 cutting strokes per minute and are especially adapted for tool room and die work.

The manufacturer's rapid power traverse mechanism for the work table, operative in the opposite direction to the feed set, is now regular equipment on these machines. Rapid power vertical traverse is also available on all machines for elevating and lowering the work table. All the shapers made by this company have a circulatory pressure system of lubrication which now includes automatic oiling to the entire crossrail unit and the crossfeed screw and nut. The push-button station for the motor is of the flush-mounted type with oil-proof conduits concealed within the main frame.

The shapers have retained the main double-crank gear transmission, the concentrated rail clamp for locking the crossrail, the single-control head lock, and the positive-lock front table support. The machines are available in a new two-tone color scheme of light and standard machine-tool gray.

Semi-Automatic Threading Machine

The four-spindle semi-automatic threading machine is one of the most flexible threading machines ever designed by engineers of the Landis Machine Company, Waynesboro, Pa. The machine in the photograph is set up to thread hollow-head set screws at the rate of 1,900 screws per hour with a cutting speed of less than 35 circumferential ft. per min. This slow cutting speed assures good quality and long chaser life even



Landis four-spindle semi-automatic threading machine

though tough alloy-steel stock is being threaded.

Indexing turrets are used on these machines when threading set screws. The turrets can be replaced easily with holding fixtures for threading bolts or special threaded parts or a gripper mechanism can be substituted for the turret or work-holding fixture if long rods or bars are to be threaded.

Air-Acetylene Soldering Iron

The Prest-O-Lite open-flame type soldering iron, recently announced by the Oxweld Railroad Service Company, Chicago, operates from a small portable B-tank of acetylene. Air for both combustion and cooling is admitted through suitable small parts in the handle which is made of metal tubing with a Bakelite hand grip and a round rubber disk which serves as a heat guard. A small valve in the pipe line just beyond the handle controls the flow of gas which, when mixed with the proper proportion of air, is ignited and burns as a small but intense flame impinging on the rounded end of the copper which is held in a U-shape fitting.

In addition to the standard soldering coppers, chisel-type and hatchet-type coppers are also available. Coppers are ample in size to retain the heat for a reasonable period of time. They can be reforged to meet special requirements without altering the heating efficiency. It is said that the Prest-O-Lite soldering iron can be operated at a low fuel cost and is well adapted for use in both locomotive and car tin shops. In car shops, especially where there is a large amount of light sheet metal work and small soldered pipe joints in connection with the installation of air-conditioning equipment, the new tool should prove of exceptional value.

Portable Electric Hammer

Faster drilling capacity and a longer life for the moving parts are obtained in the No. 36 portable electric hammer, redesigned by the Black & Decker Mfg. Co., Towson, Md., by an increase in the motor capacity and the efficiency. This tool is a

The Black & Decker No. 36 portable electric hammer

completely self-contained unit which is powered by a universal motor and requires no transformer, rectifier, or other extra equipment.

No change has been made in the operating principle of this hammer. The action is developed by an oscillating weight and spring assembly; the weight is driven indirectly by a crank. The motor is

Prest-O-Lite open-flame type soldering iron

mounted at right angles to the barrel and operates through a train of reducing gears. The action is characterized by a definite "follow-through" stroke and produces a high efficiency. The hammer weighs 17 lb., and develops 2,300 blows per minute.

Machine Combines Milling and Shaving

The surface finish obtained with the Newton straight-line type Mill-N-Shaver is said to be smoother and more accurate than that produced by rough and finish milling, and to approach the finish that might be obtained by grinding. In operation this machine rough mills and then shaves the work on the rapid-traverse return stroke, and the cycle of operation is automatic from the manual start to the stop at the position to remove the work from the table. The cutter spindle is mounted in anti-friction bearings and is driven by an individual motor. The machine is equipped with hydraulic feed and traverse for the table.

The Mill-N-Shaver may be arranged with one or more unit milling heads and with the same number or less of shaving heads depending on the requirements of the work. The heads may be horizontal or vertical or placed at any angle to suit the surface to be finished. The shaving head is a heavy tool block in which is mounted one or more tungsten-carbide blades. The head is on a ram which has a micrometer adjustment for setting the depth of the cut. The ram automatically draws back out of the way while the work is rough milled and resumes the cutting position just before the rapid traverse of the return stroke takes place.

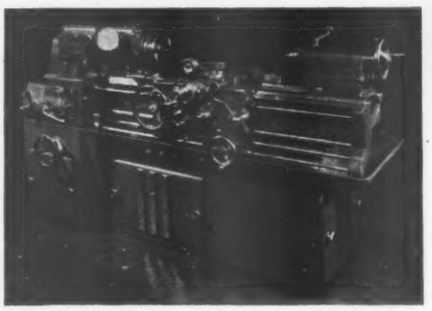
In operation the work is loaded and clamped in the fixture and the cycle is started manually. Automatically, the shaving head is drawn back to clear the work and the table advances in rapid traverse which changes to a feed motion as the work reaches the rough-milling cutter. At the end of the rough-milling cut the shaving head advances to the cutting position and the work is shaved as the table returns in rapid traverse to the loading position. This operation produces a smooth and accurate surface and eliminates the time required for a finish cut with a milling cutter.

The Mill-N-Shaver is made with either a horizontal or vertical spindle. The machine is built by the Consolidated Machine Tool Corporation, Rochester, N. Y.

The Newton straight-line type Mill-N-Shaver with vertical spindle

Lathe Powered With All-Electric Drive

The Monarch 12-in. by 30-in. toolmaker's lathe is powered with a recently developed a.c., all-electric adjustable-speed drive which employs a proved principle of speed

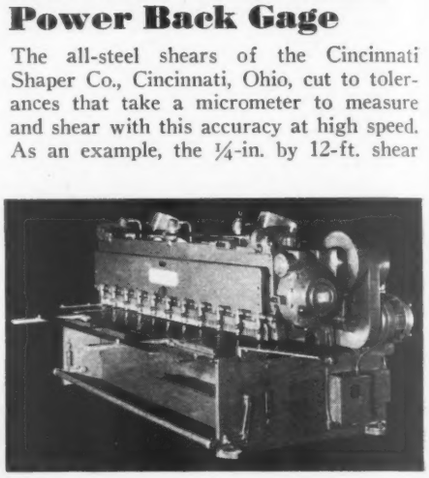


The Monarch 12-in. by 30-in. toolmaker's lathe

control heretofore confined to large drives. The 100-to-1 spindle-speed power unit is entirely self-contained and is mounted in the cabinet base. The drive is through a new type of flat belt. Two range of spindle speeds from 15 to 1,500 r.p.m. are obtained by means of a back-geared unit on the spindle. This range may be varied to suit the user's requirements. The machine is built by the Monarch Machine Tool Co., Sidney, Ohio.

All-Steel Shear with Power Back Gage

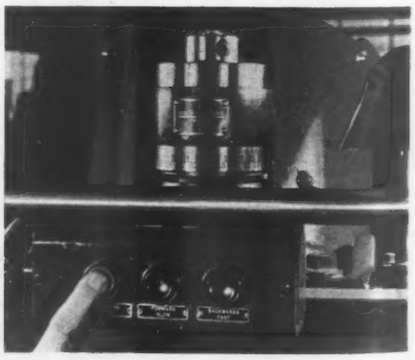
The all-steel shears of the Cincinnati Shaper Co., Cincinnati, Ohio, cut to tolerances that take a micrometer to measure and shear with this accuracy at high speed. As an example, the ¼-in. by 12-ft. shear



The Cincinnati all-steel shear equipped with a power back gage

makes 60 strokes a minute. Hydraulic hold-downs automatically clamp any gage of metal with the same pressure and efficient use of the four-edge knives is obtained because of the fine adjustments that can be made. All standard sizes of shears from ten gage to one inch are available.

The shear illustrated is equipped with a front-controlled power back gage which is available as extra equipment on these machines. Push-button control is from the



The control and dials of the power back gage for Cincinnati all-steel shears

front of the shear conveniently located at the operator's position. As shown in one of the illustrations, the dials reading in inches and sixty-fourths of an inch are mounted above the finger-tip control. A fast forward and a fast backward speed give rapid movement to the desired position and a "spotting" button sets the gage accurately. The gage is advantageous in work requiring frequent changes of back-gage setting.

Bronze Welding Rod Is Coated with Flux

Maximum speed, convenience, and economy are required for profitable welding operations. A development of this emphasis on efficiency is the CIG Ready-Fluxed bronze, a product of the Hollup Corporation unit of Compressed Industrial Gases, Inc., Chicago. Dipping into the flux is eliminated by the use of this bronze welding rod. It is designed to keep the molten metal in a semi-plastic state to enable welders to apply it in any position with ease, and to keep it fluid enough for all brazing operations. In its manufacture the flux is extruded in a perfectly concentric coating which assures a uniform fluxing throughout the entire length of the welding rod.

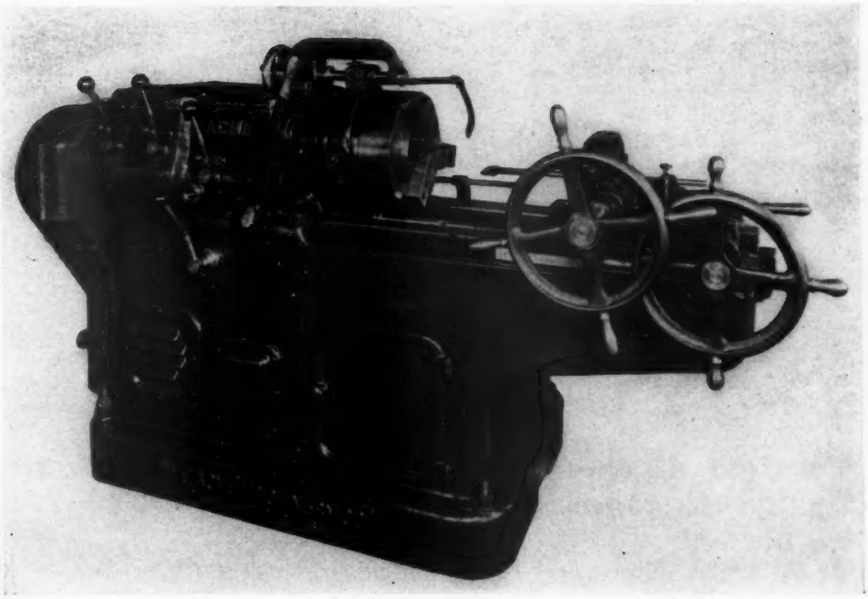
Three sizes of CIG Ready-Fluxed bronze welding rod

The CIG 400 Ready-Fluxed bronze welding rod has a tensile strength of 58,500 lb. per sq. in., an elongation of 30.1 per cent in 2 in., a hardness of 85 Brinnell, and is obtainable in 36-in. lengths. The CIG 401 Ready-Fluxed manganese-bronze welding rod has a tensile strength of 62,000 lb. per sq. in., an elongation of 27 per cent in 2 in., and a Brinnell hardness of 95. It is also available in 36-in. lengths.

Threading Machine Has Revolving Head

A rolled thread of any length on bar stock up to 1½ in. in diameter is produced on the Acme XR roll-threading machine just announced by the Acme Machinery Company, Cleveland, Ohio. This machine is the result of research and development work by the Acme engineers for a type of roll threading that has never been accomplished before; namely, the threading of bar stock in a range up to and including 1½-in. diameter without limit to its length. The adjustment from one diameter to another is quickly and easily made. The machine is rugged and compact and requires very little floor space.

The principle of this machine is different from the conventional roll-threading equipment in that the work is held stationary while the rugged die rolling head revolves, permitting the stock to lead through the die head and only the length of the stock limits the length of the thread that can be rolled. Holding the work stationary facilitates the handling of long, cumbersome bars which are being threaded.



The Acme XR roll threading machine with 1½-in. die head

The form of the thread produced by the Acme roll-threading machine is extremely accurate while the pitch diameter and the lead is held within limits of thousandths of an inch. The burnishing action of the rolls in forming the threads imparts a thread-surface smoothness that has the appearance of a ground thread. This action also imparts a slight surface hardness to the thread and strip tests show a 15 per cent increase in strength over the cut thread. The speed of thread rolling is from 15 to 50 per cent higher than thread cutting, depending on the material and the kind of thread.

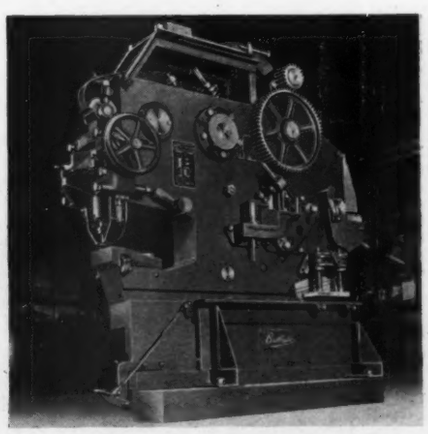
Triple threads with 1½-in. lead have been successfully rolled on stock slightly less than ¾ in. in diameter. The hardness of the stock to be threaded must be considered, but good results have been obtained in the rolling of U. S. S. 1-in., eight-pitch threads in S. A. E. steel having a hardness of 30 to 40 Rockwell. A saving of 15 per cent or more, depending upon the diameter of the bar stock, is obtained in the rolling of threads as the size of the stock is the same as the pitch diameter of the rolled thread.

In appearance the Acme XR roll-threading machine is very similar to the Acme XL thread-cutting machine. The bed is of a sturdy box-type fabricated construction with high-carbon steel ways. It has an eight-speed gear box, clutch controlled, with the gears and shafts mounted on antifriction bearings running in oil. The work-holding carriage is actuated by a double rack and pinion.

This machine also has the exclusive Acme feature of the micrometer adjustment of the head for controlling the pitch diameters without stopping the head rotation. It has a multiple V-belt drive from a motor enclosed in the bed and friction-clutch control for starting and stopping the spindle. On single-spindle machines with work capacity up to 1½ in. diameter a five-hp. motor is furnished. The Acme XR roll-threading machine is built with single or double spindles.

IronWorker Performs Several Operations

The Buffalo No. 2½ universal Ironworker is a popular size of this machine in plants requiring a concentration of various operations in one machine. It will punch round, square or oblong holes in plates, angles, flanges and webs of channels and I-beams. It will shear angles either square or to right- or left-hand miters of 15, 30, or 45 deg. It will also shear round, square, and T-bars. The standard bar-cutter knives can be quickly replaced with extra knives that will shear channels and



The Buffalo No. 2½ universal Ironworker

I-beams with accuracy. In addition to these operations, the machine is designed to shear flats and split plate of unlimited width and to notch and cope angles and flanges of channels and I-beams.

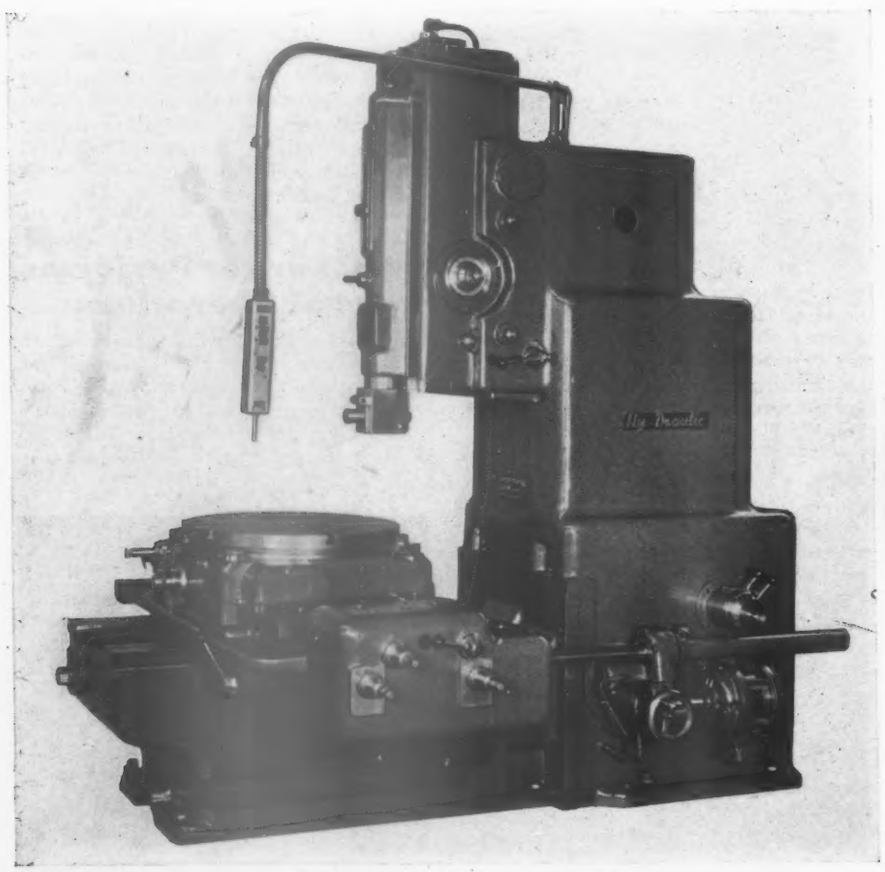
The frame of this machine is of heavy armor-plate construction, electrically welded into a solid unit that is rigid under maximum load. The gears are of steel. An Alemite high-pressure system furnishes the machine with centralized lubrication. It has SKF high-speed bearings and full safety guards. The machine is made by the Buffalo Forge Company, Buffalo, N. Y.

Vertical Shaper With Hydraulic Ram Drive

While designed to perform work in the field of vertical shaping rather than the heavier operations of slottings, the Rockford 12-in. Hy-Draulic vertical shaper has the same general lines as the Rockford Hy-Draulic vertical slotter. This new machine, built by the Rockford Machine Tool Company, Rockford, Ill., has speed and accuracy in addition to the power and rigidity demanded by the heavier class of vertical shaping. The hydraulic drive of the ram is designed to give a total of 150 strokes per minute with a minimum stroke of one inch, while the table has micrometer adjustments for the setting of longitudinal and lateral travel.

The ram bracket is mounted in the box-section column on trunnions which permit the ram to be tilted 10 deg. from the vertical. The hydraulically operated ram is mounted in heavy-duty shaper-type ways and it has an adjustable crosshead mounted on a screw to which the actuating piston is attached. The ram is furnished with a 360-deg. swiveling tool head. Dual start and stop levers, one on each side of the column, permit control of the ram from either side of the machine.

The hydraulic pump is mounted inside of the column and is driven by a constant-speed motor carried on a bracket on the left side of the column. The pump controls for setting the speed of the ram in both cuting and reverse strokes are mounted in the right side of the column. The hydraulic table-feed cylinder with its adjusting screw and feed-shaft bracket is also mounted on the right side of the column as is the table rapid-reverse motor. Both the traverse motor and the hydraulic feed operate in one direction through a common splined drive shaft.



The Rockford 12-in. Hy-Draulic vertical shaper

The bed is a strong, ribbed casting securely bolted to the column. The rotary table is 28 in. in diameter and is carried on accurately scraped alloy-iron bearings having pressure lubrication which gives the table a high resistance to deflection under heavy cuts and freedom from run-out in rotation. The table is equipped with a manually controlled indexing or locking device actuated by a knurled knob at the front of the table. Rapid traverse is controlled from the motor-control pendant switch which also has jog and run positions.

Both the saddle and the slide are channelled to receive precision measuring bars which, in conjunction with dial indicators, give the same accuracy of setting in both the longitudinal and lateral movement of the table as is provided in jig-boring machines. This feature and a dividing head for accurate indexing of the rotary table may be obtained if ordered.

Constant-pressure lubrication from the hydraulic circuit is supplied to the ram. A one-shot lubricating unit supplies oil to all bearing and way surfaces of the saddle, cross slide, and rotary table. The gear boxes, main table-drive gearing, and all anti-friction bearings are permanently packed in grease.

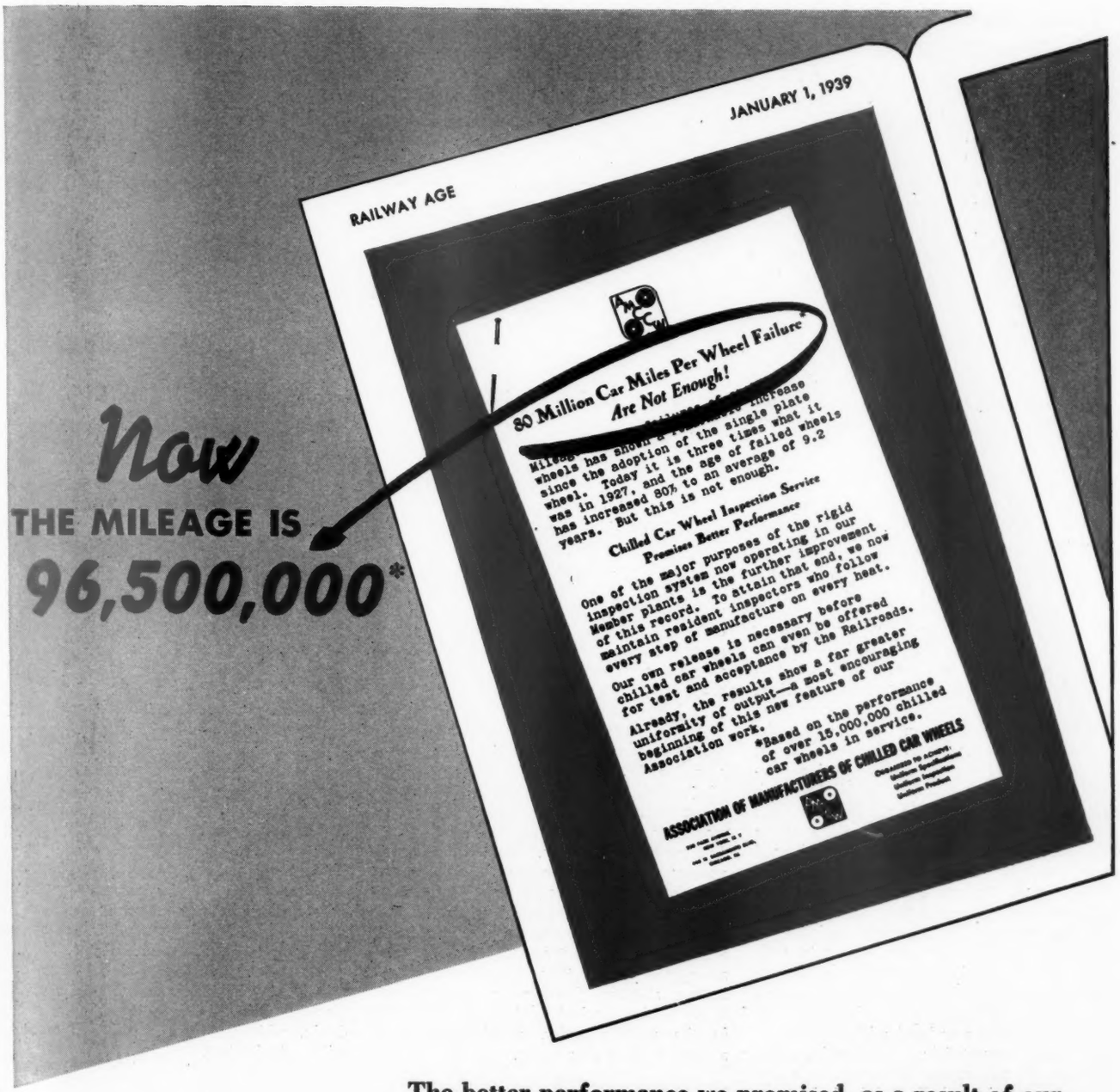
Grinder With Built-In Electrical Controls

The Norton 6-in. by 18-in. type C cylindrical grinder has built-in electrical controls and is arranged for hydraulic traverse of the table. All mechanisms are easily accessible for adjustment. The coolant and oil pumps are individually motor driven, run submerged, and are spring mounted. A separate pump supplies the lubricant to the table- and wheel-slide ways.

The Norton 6-in. grinding machine

The electrical controls are built into the back of the machine, and cored openings in the base are provided for that purpose and to keep them free from dust and dirt. The centralized controls permit the convenient and time-saving operation of the machine. The headstock has been equipped with an eccentric take-up of the drive chain for keeping it in proper tension. Larger centers is one of the improvements made in the headstock and footstock. Protective telescoping guards are furnished for the base ways as standard equipment. The unit-type construction which has been used throughout the machine is efficient from the standpoints of adaptability and maintenance. This grinder is made by the Norton Company, Worcester, Mass.

(*Turn to next left-hand page*)



*Average still based on performance of over 15,000,000 wheels in service.

The better performance we promised, as a result of our inspection service and continued manufacturing improvement, is already being realized. Further steps have been taken towards our goal "To make every wheel as good as the best."

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

230 PARK AVENUE,
NEW YORK, N. Y.

445 N. SACRAMENTO BLVD.,
CHICAGO, ILL.

AMCCW

ORGANIZED TO ACHIEVE:
Uniform Specifications
Uniform Inspection
Uniform Product

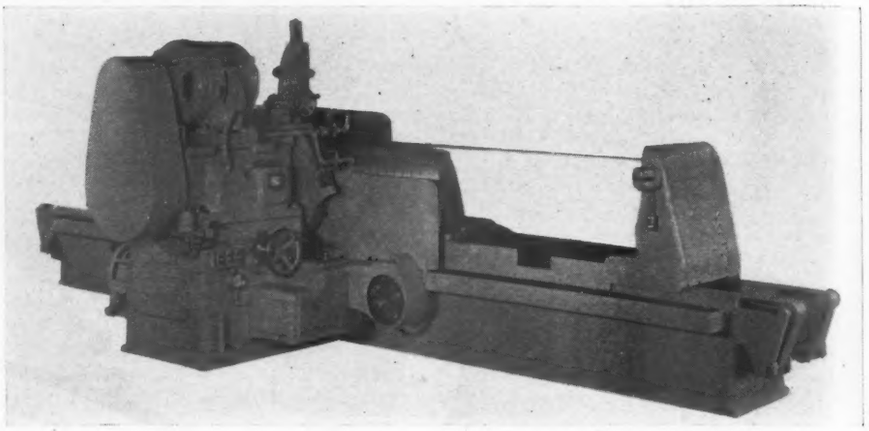
Face Grinder with Hydraulic Table Drive

Engineers of the Hanchett Manufacturing Co., Big Rapids, Mich., have developed a line of face grinders one of the features of which is a hydraulic table drive. Two pistons and cylinders are used, one to pull the table in each direction, rather than a single cylinder which pulls the table in one direction and pushes it in the other.

The table of the No. 986 face and knife grinder, illustrated, is 36 in. wide and 86 in. long. The table ways are lubricated with a forced-feed oiling system comprising a small motor, oil reservoir, pump, filter, and pressure gage. The ways are protected with a patented belt cover; the belts are joined to one end of the table, pass over the ends of the ways and entirely through the bed, and are fastened to the other end of the table. The table has an infinite range of speeds up to 90 ft. per minute.

The horizontal grinding-wheel spindle is mounted in Timken tapered spindle bearings of large diameter. The grinding wheel is of the segmental type holding abrasive blocks with a 2-in. or 3-in. face and is usually 30 or 36 in. in diameter. The 40- or 50-hp. grinding-wheel motor is placed on a hinged mounting directly above the spindle and the drive is through V-belts and sheaves. The grinding-wheel head is mounted so that the outer end can be adjusted up or down or swung to the right or left. This arrangement makes it possible to set the grinding wheel at exactly right angles to the top of the work table and also to swing the head around to provide clearance for the up-side of the grinding wheel. The grinding-wheel head has hand or automatic feed toward or away from the work being ground. A lever-operated hand brake on the wheel spindle enables the operator quickly to stop the wheel after the power is shut off. The motor is connected to a built-in ammeter which is important in determining the cutting efficiency of the grinding wheel.

The wheel-dresser head with a serrated-steel cutter mounted in a ball-bearing spindle has an adjustment to compensate for the wear of the spindle. All of the controls, including the coolant supply and the dog set for the length of the table stroke, are within reach of the operator in his usual working position.



The Hanchett No. 986 face and knife grinder with horizontal spindle

arrangement leaves space in the head for final spindle-driving gears of unusually large diameter for slow-speed high-power drives. The fast speeds are transmitted by multiple V-belts to the rigid 4½-in. diameter main spindle, having a 48-in. continuous traverse by means of a lead screw. This construction is adapted for the provision, if desired, of thread leads for screw cutting. Spindle feeds are taken off the spindle sleeve and are not affected in the rate per revolution by spindle-speed changes. All gears run in oil.

A large dial on the front of the head indicates directly the distance the spindle extends beyond the face plate and serves as a depth gage for the full 48-in. traverse of the spindle. An adjacent dial can be set to trip out the spindle feed automatically at any desired position within its full range of traverse. All motions have power rapid traverse and are provided with electric limit switches. Adjustable trips serve automatically to feed and rapid-traverse the table thereby expediting the milling of interrupted surfaces such as spaced pads. The provision for the instant shifting from cross feed of the table to the vertical feed of the head, or in the reverse order, facilitates milling around rectangular edges.

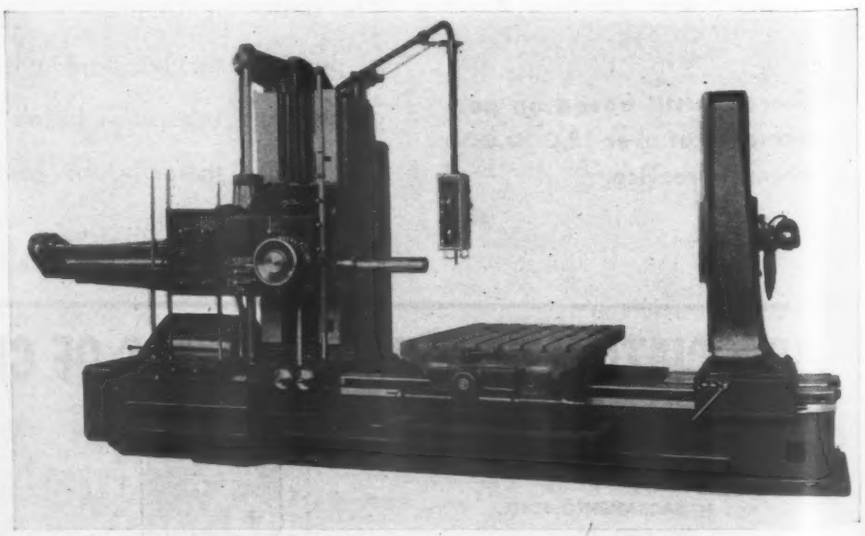
Because of the weight of the sturdy back rests of these large boring machines an individual motor with directional push-button control is installed on the base for traversing the back rest longitudinally along the bed. When the back rest is clamped to the bed, the clamp lever covers the control buttons so the traverse motor can not be operated. The back-rest block is clamped in the vertical position by means of a torque motor which is automatically operated by remote control simultaneously with the head clamps and is interlocked with the vertical feed, thus insuring safety and saving the operator many steps. The saddle clamps are interlocked in a similar manner with the power motion.

Steps along the front of the bed and sides of the saddle at the front end lead to sectional covers across rigid permanent covers protecting the bed ways. These steps and covers have non-slip treads for the safety of the operator when he is standing in a convenient position to reach long or high jobs while setting up, adjusting tools, or watching cuts.

All these advantageous features are obtainable in the larger new model No. 548 machine with 5-in. spindle and with a bed 48 in. wide and in the No. 560 machine with a 60-in. bed.

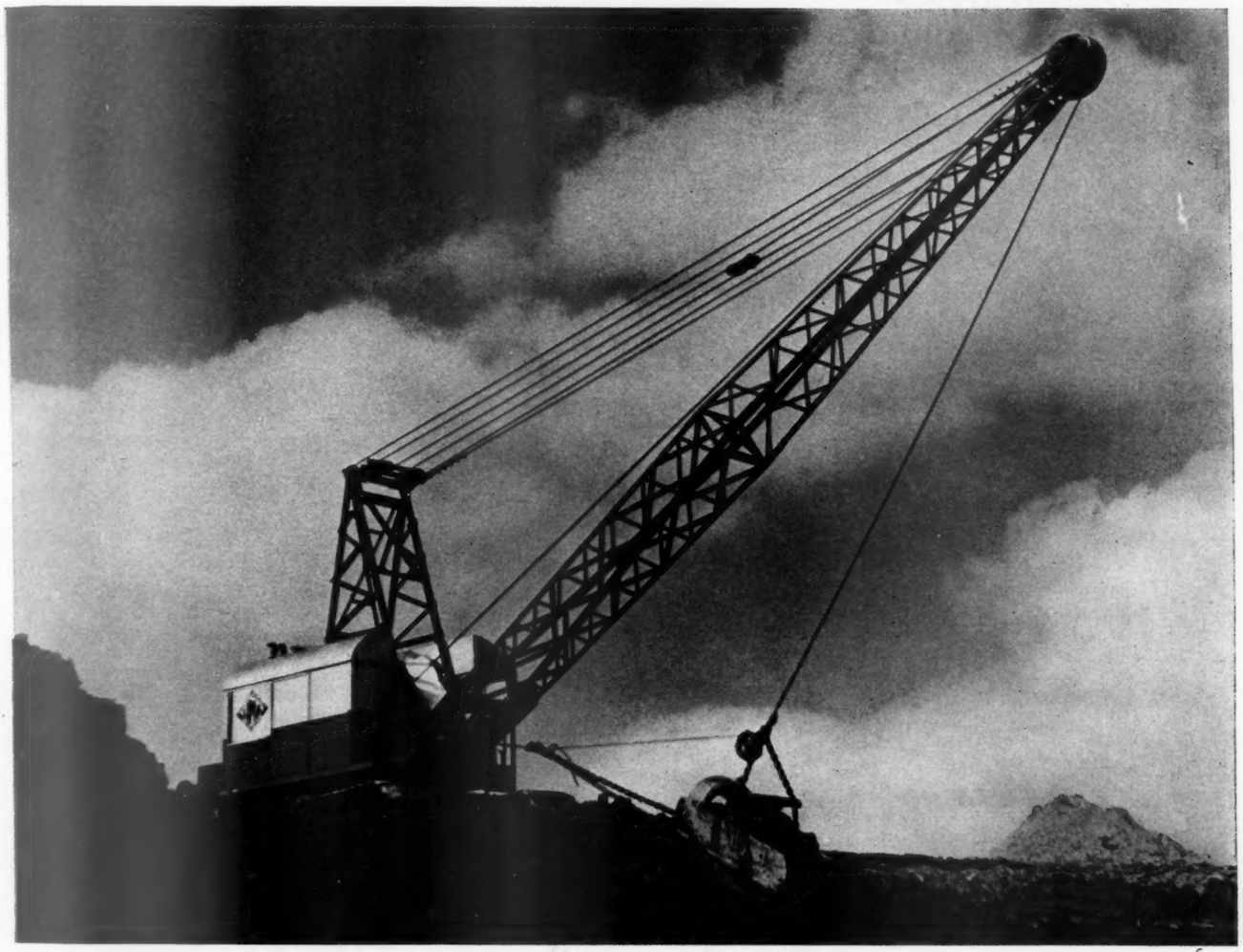
Horizontal Boring Machine

Convenience of control and operation is a feature of the new No. 436 horizontal boring machine built by the Lucas Machine Tool Co., Cleveland, Ohio. It has multi-position, electric-pendant, directional control of spindle rotation and the traverse of all sliding units including the spindle, and Hi-Lo dual control (at the head or bed level) for shifting gears in the speed and milling feed-change gear boxes located on the bed where there is ample room for a large-size mechanism and the weight does not have to be counterbalanced. This



The Lucas No. 436 horizontal boring machine

(*Turn to next left-hand page*)



LIMA POWER SHOVELS, CRANES AND DRAGLINES

are built to "Lima Quality" Standards

The high quality of manufacture that railroads associate with Lima locomotives is also present in Lima power shovels, cranes and draglines.

Modern in design, this line of equipment, from three-quarter yard to four yard capacity, is serving well the leading contractors of the country as well as many railroads.

Its dependability makes it favored where the going is toughest.

LIMA LOCOMOTIVE WORKS, INCORPORATED, LIMA, OHIO

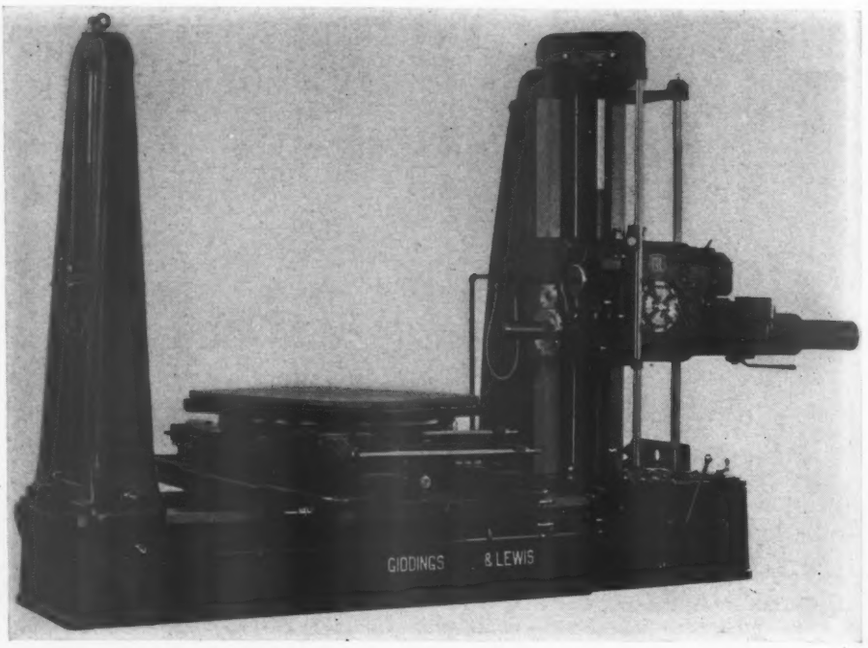
LIMA
LOCOMOTIVE WORKS
INCORPORATED

Built-In Revolving-Table-Type Machine

A built-in-power revolving-table-type machine is the newest addition to the 30-Series of high-power, precision, horizontal boring, drilling, and milling machines built by the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. This machine incorporates all the features of the standard 30-Series table-type machines and has, in addition, the power revolving table. This design increases flexibility and reduces set-up costs because the revolving table allows complete turning of the job to any position within the full 360 deg., permits the machining of a job on different sides at one set up, and eliminates the necessity for mounting and dismounting an auxiliary revolving table with the resulting time-consuming operations.

The table top on this machine is approximately 7 in. lower than that of the standard table-type machine with a mounted auxiliary revolving table. This distance means an increase in the vertical range of the headstock, greater convenience for the operator, and greater rigidity because the revolving table is an integral part of the machine and is mounted closer to the bed.

The rotary movement of the table has 18 rotary feeds and a rapid traverse while the 48-in. cross travel of the table is also furnished with 18 feeds and a rapid traverse. The table is graduated in ½ deg. and has four indexing stops with a hand adjustment to .001 in., obtained through a micrometer dial at exact 90-deg. intervals. Additional indexing intervals may be obtained.

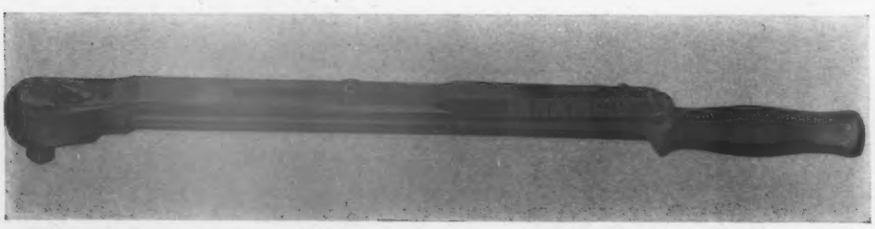


Giddings & Lewis 30-series 340-RT built-in-power revolving-table-type machine

Wrench Indicates Applied Torque

The No. S-57 torque Measurrench announced by J. H. Williams & Co., New York, indicates applied right-hand torque and has mechanical features which make it an efficient and durable tool. It is a reversible ratchet wrench for use with any detachable socket having a ½-in. square drive. The wrench may be used in two ways: (1) By sight reading of a calibrated scale which shows applied torque from 20 to 200 ft. lb., and (2) by sound reading in which a sharp sound signal is given for any pre-determined torque from 35 to 200 ft. lb.

The 36-tooth ratchet wheel with a patented twin double-tooth pawl makes possible the unusually short operating swing of one-thirtieth of a full turn. The wrench action is instantly reversed for left-hand turning by a flip of the shifter and is flush with the head which is compact and free of protrusions. Every part is made of high-tensile alloy steel, accurately machined and heat treated. The wrench is 19½-in. long and is finished in chrome-plate.

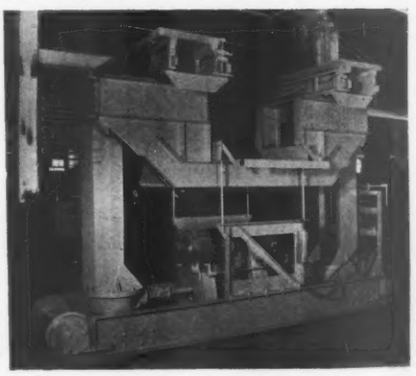


The Williams No. S-57 torque Measurrench

Two-Screw Drop-Pit Table

The two-screw model B drop table shown in the illustration is made by the Whiting Corporation, Harvey, Ill. This 30-ton capacity machine is for use by a western railroad at its Diesel-electric shop for removing single pairs of power wheels, including the motors, from Diesel-electric locomotives and single pairs of wheels from under coaches. It is equipped with a goose-neck lifting beam with flooring in the depression at its middle in order to have this flooring level with the inspection pit when the table top is locked in position at ground level.

The detachable table top is made in two halves and because of this arrangement each half has outside locking bars in addition to the conventional locking bars located below the table-top rails. The motor drives an enclosed herringbone gear reducer. The reducer drives the single shaft that revolves the two bevel gears in the end housings that turn the two hoisting screws. The goose-neck lifting beam is equipped with two upper and two lower rollers at each end which bear against the outside of the flanges of the vertical end beams. This table is motor racked and has a power cable take-up reel. The machine is easily hand racked because the truck wheels are mounted on roller bearings.



The Whiting two-screw drop-pit table in a raised position

The two-screw model B drop table can be obtained with a straight lifting beam and conventional table top. The table-top width and the machine capacity can be increased to handle the largest pair of drivers under modern steam locomotives as well as the Diesel-electric locomotive wheels. It is adaptable for use on small railroads having a few locomotives and on large railroads at outlying points where tables are needed and a low-cost installation is practical.

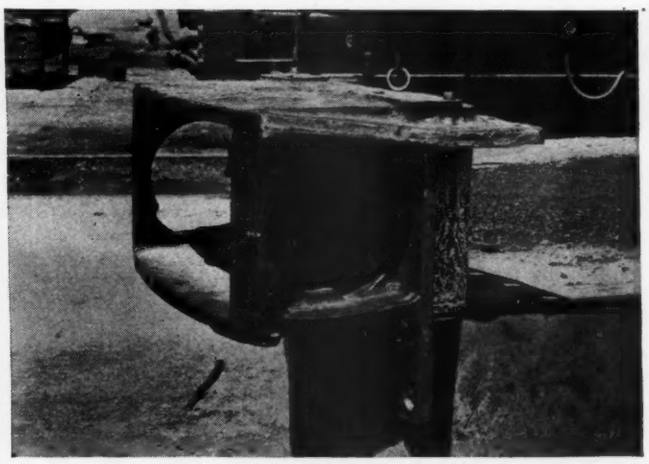
(Turn to next left-hand page)

ELIMINATE EXCESSIVE VIBRATION

by making this simple installation of an E-2 Radial Buffer

1 Old-style chafing plate pocket before laying out and cutting for application of E-2 Radial Buffer.

2 View showing cut-out section for application of E-2 chafing plate pocket.

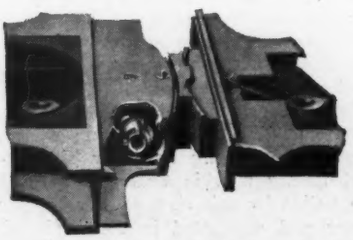


3 Chafing Plate Pocket of E-2 Radial Buffer ready for installation in cut-out section illustrated on the left.

4 Welded to tender frame chafing plate pocket of E-2 Radial Buffer prior to installation of internal parts.

5 View showing assembled unit — tender end.

Excessive vibration can be avoided, and passenger comfort increased, by the application of the E-2 Radial Buffer. The Buffer can be installed in less than two days. It permits full freedom of lateral and vertical movement, assures maximum safety, and results in engine and tender becoming a single unit with vastly improved riding qualities and lowered maintenance.

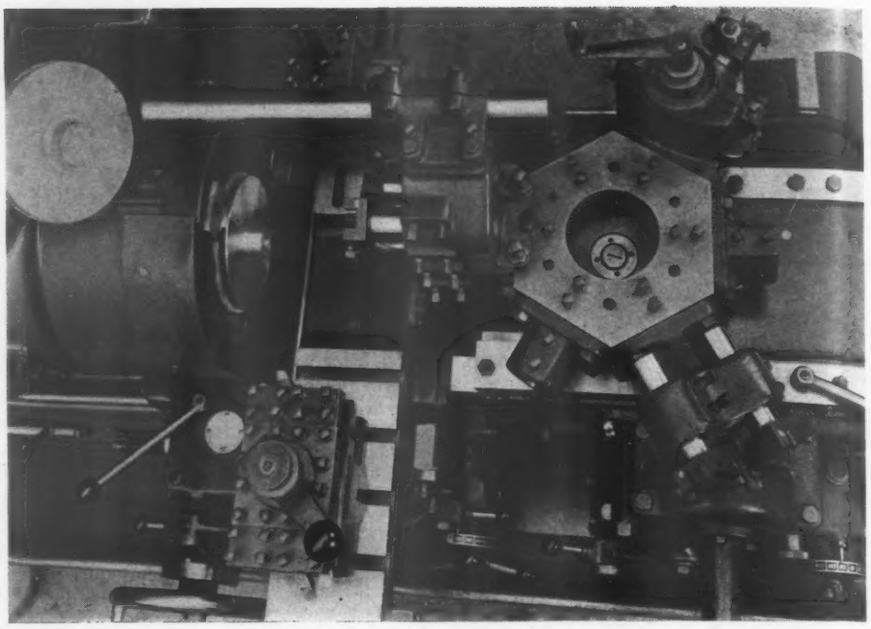


FRANKLIN RAILWAY SUPPLY COMPANY, INC.

NEW YORK
CHICAGO
MONTREAL

Rapid Traverse For Lathe Cross Slide

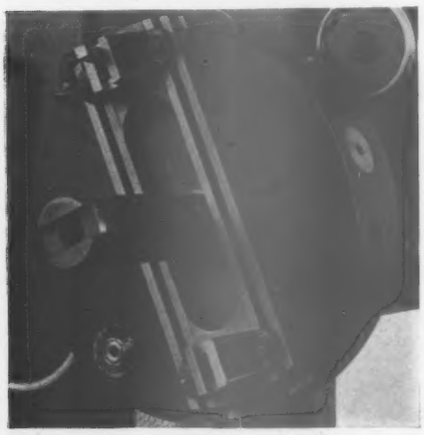
The cross slides of both the ram- and saddle-type universal turret lathes of the Jones & Lamson Machine Company, Springfield, Vt., can now be furnished with power rapid traverse. The illustration is a view of a No. 5 J. & L. ram-type universal turret lathe equipped with this attachment and tooled to machine a bronze pump impeller. On jobs like this where fast cutting tools are used and even long facing cuts are made in six seconds or less, the power rapid traverse of the cross slide reduces human fatigue and brings the handling time closer to the actual cutting time.



A Jones & Lamson ram-type universal turret lathe equipped with power rapid traverse for the cross slide

Continuous-Feed Facing Head

A new accessory of unusual flexibility, the continuous-feed facing head, has been added to the line of auxiliary equipment for horizontal boring, drilling, and milling machines made by the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.



Giddings & Lewis continuous-feed facing head mounted on 30-Series headstock with the main spindle extended

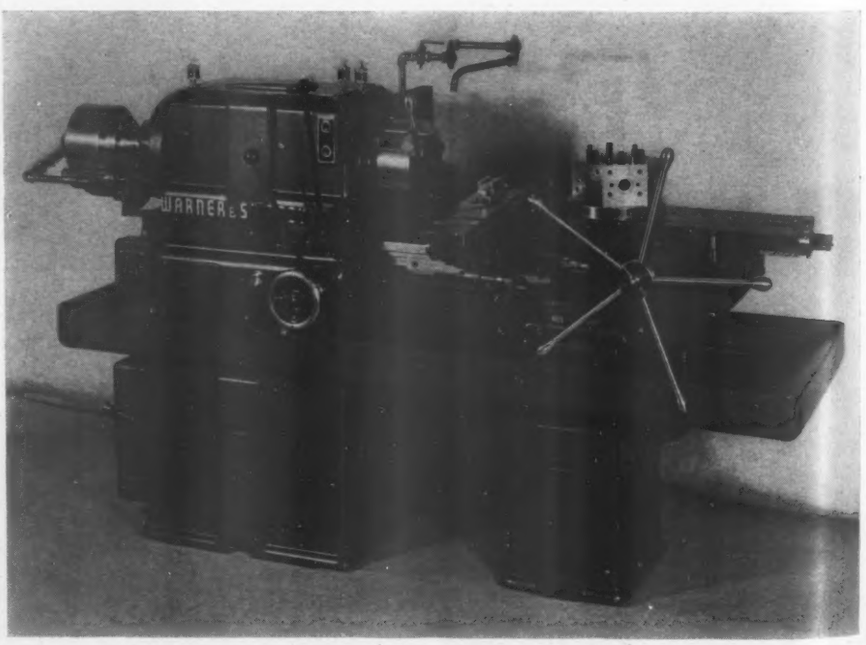
It is arranged for attachment to the spindle sleeve. It has a hardened ground bushing through which the main spindle can slide freely, making it possible to perform facing and boring operations at the same time. A feed unit to provide six continuous feeds from .006 in. to .125 in. per revolution in geometrical progression is built into the facing head to feed the cross-slide for facing operations. A shifting lever is used to engage the power feed and control the direction of the feed. When the power feed is disengaged, the head may also be used as an extremely large offset boring head for single-point tool boring and, in order to adjust the cross-slide for this class of work, a micrometer dial graduated in thousands of an inch is furnished.

Such operations as counterboring, boring of large-diameter holes, facing, turning and grooving-flanges, recessing and countersinking are performed accurately and easily with this unit. The continuous-feed facing head may be attached or removed from the machine in a very few minutes.

Turret Lathe For Brass Work

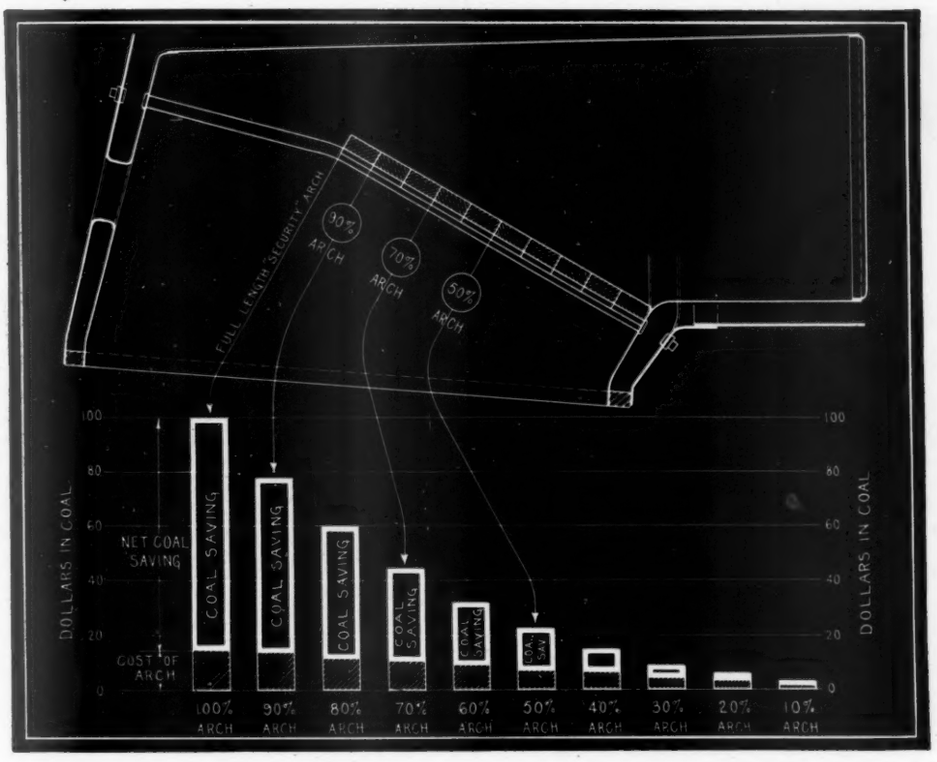
A new turret lathe for brass work has been designed by the Warner & Swasey Co., Cleveland, Ohio. It has a 16¾-in. swing, a simple, direct, two-speed drive and an electrically operated mechanical brake, and is built for high-speed operation and cutting. The turret slide and saddle are completely guarded to keep chips out of the operating parts.

One of the features of the lathe is the automatic control of the two spindle speeds and the reverse which is operated by the movement and indexing of the hexagon turret. With this equipment, the operator only starts and stops the machine and sets the controls. The machine will go through automatically any cycle of the two speeds and forward and reverse. It is designed to be equipped with a stationary air cylinder to permit the faster reversal of the spindle. Diagonal ribbing, similar to bridge truss bracing, will be standard on all Warner & Swasey lathes.



The Warner & Swasey turret lathe designed especially for brass work

(Turn to next left-hand page)



THE EFFECT OF ABBREVIATED ARCHES ON FUEL SAVING

LET THE ARCH HELP YOU SAVE

With the emphasis being placed on saving every railroad dollar, the locomotive Arch becomes increasingly important.

Regardless of the amount of traffic handled, the locomotive Arch saves enough fuel to pay for itself ten times over.

Be sure that every locomotive leaving the roundhouse has its Arch complete with not a single brick nor a single course missing.

In this way, you will get more work for each dollar of fuel expense. Skimping on Arch Brick results in a net loss to the railroad.

THERE'S MORE TO SECURITY ARCHES THAN JUST BRICK

HARBISON-WALKER REFRACTORIES CO.

Refractory Specialists

AMERICAN ARCH CO.
INCORPORATED
60 EAST 42nd STREET, NEW YORK, N. Y.
Locomotive Combustion Specialists

High Spots in

Railway Affairs . . .

Railroad Employment Climbing

Increased business and the speeding up of the maintenance programs made it necessary to increase considerably the number of employees on the railroads during the month of September. The exact figures for this increase are not yet available, but it is interesting to note that there has been a steady growth in railroad employment during recent months, even before matters reached a crisis on the other side. The I.C.C. preliminary figures for mid-August, for instance, showed 1,004,619 employees, an increase of 0.25 per cent over the previous month, and of 6.9 per cent over mid-August, 1938. That there has been a concentration on maintenance is indicated by the fact that both the maintenance of way and structures and the maintenance of equipment and stores forces were up a little more than 11 per cent, as compared to a year ago, while the increase in the train and engine service group was only 5.21 per cent.

Railroad Man Canadian Censor

No one can doubt the earnestness of purpose with which Canada has entered the war. Certainly it has shown excellent judgment in selecting Walter Scott Thompson, chief of the Canadian National's publicity organization, to become director of censorship, including press, radio, mail and cables. Mr. Thompson is known as the "dean of Canadian publicity men" and is one of the most widely traveled men in Canada, having covered some 50,000 miles a year for the Canadian National in maintaining contacts with newspaper men and writers.

Joe Eastman's Advice to Employees

Chairman Joseph B. Eastman of the Interstate Commerce Commission, rested by a recent vacation in the Canadian woods, made some very frank suggestions at the meeting of the New England Shippers Advisory Board at Burlington, Vt. It is a bit unusual on such occasions to refer to employee relations, but the commissioner did indicate that the railroad employees can be very helpful in improving conditions. "I think from their point of view, as well as from the point of view of the public," said the commissioner, "they might well pay less rigid attention, may be less combative, less insistent, to rights and privileges and working rules, which were recognized in the old days but which do not fit modern conditions any more than the old-fashioned passenger coach fits the modern passenger travel. I think they can be more co-operative in seeking economy and efficiency in the railroad operation, and also more considerate of the public. I mention that for their own sake as well as for the sake of the public, because I think they will find, unless they do adopt that attitude, that there are victories which can be turned into defeat, and they will find some of the policies which they seem inclined to pursue do them more harm than good."

Pipe Lines Extending Fast

There has been unusual activity in the construction of pipe lines for conveying crude oil, natural gas and gasoline during the first nine months of this year; indeed, the Oil and Gas Journal states that there has been more activity than in any similar period since 1930. Over 4,000 miles of new line has been recently completed or is now being laid, representing an expenditure of about $100,000,000 thus far this year. It is said that the transportation of gasoline through pipe lines is becoming increasingly important. Some of the old crude-oil lines are being reconditioned or converted to this purpose. It is estimated that a total of 1,180 miles of pipe lines for gasoline transportation will be constructed in this country this year.

Jesse Jones Says a Good Word for the Railroads

The railroads are unaccustomed to receiving very much in the way of commendation from people high in government authority. Jesse Jones, federal loan administrator, in his press conference on September 18, patted them on the back a bit, however, when he suggested that the railroads have done a pretty good job, considering the small amount of revenue they have had in the last few years. He pointed out that the railroad outlook is now more favorable than it has been for several years. Business has been picking up generally and the prospects are bright for additional traffic. He concluded with the statement that the railroads "are thoroughly alive to their responsibility in this emergency, if this can be called an emergency." Much more to the point, Mr. Jones indicated that the government was in a position to advance funds for additional new railroad equipment as well as for equipment repairs. He pointed out, however, that most of the railroads are getting their money privately at lower rates than the R.F.C. can provide. In case interest rates harden, as is quite likely, the carriers which do not have private commitments may have to call upon the R.F.C.—and presumably Mr. Jones will accommodate them.

Freight-Car Loadings For Fourth Quarter

Compilations made by the thirteen shippers advisory boards indicate an increase of about 13.8 per cent in freight-car loadings in the fourth quarter of 1939, as compared with those of last year. Apparently, however, this estimate is based on replies to the questionnaires which were submitted to the individual shippers early in September and before the effect of the European conflict could be properly evaluated. Without doubt the increase in loadings will be much greater than was estimated; in fact, it is understood that a recanvass may be made early in October and a revised forecast issued. The sudden spurt in orders for railway equipment and supplies, in itself, should be an important factor in the movement of a much larger amount of freight in the next few months.

Keep the Cars On the Move

Many reports have been received indicating that the mechanical departments of the railroads are speeding up their programs of freight-car maintenance. Large numbers of new freight cars are also being ordered. The big problem as business increases is to get the greatest amount of service out of every single piece of equipment. An analysis of freight-car operation indicates clearly that the weak spot today is in the time that the cars are held by the shippers and receivers of freight. This is not due to lack of interest on their part, but rather because there has been a surplus of equipment for a long time and the shippers and receivers of freight have not been under any pressure to load or unload the cars promptly or otherwise co-operate in getting a maximum amount of service out of them. As part of the game to speed up operations to insure that the present equipment will meet the current requirements, even though they should be greatly intensified, the Car Service Division of the Association of American Railroads has drawn up ten suggestions—not commandments—from (a) to (j), telling exactly how the shippers and receivers of freight may co-operate to the very best advantage. Judging from the fine way in which the Regional Shippers Advisory Boards have co-operated with the railroads for many years, there is little question but what they will join heartily with the railroads in this game of securing the greatest possible utilization of the equipment. The Car Service Division has also issued a statement to the railroads concerning specific measures which they should adopt which will keep the cars on the move and insure maximum capacity from the equipment.

(*Turn to next left-hand page*)

THE SUPERHEATER AS A FACTOR IN LOCOMOTIVE DESIGN

Maximum Ton Miles Per Hour

	BOILER DIAMETER	TRACTIVE FORCE
*1	87½	43,300
*2	89	44,500

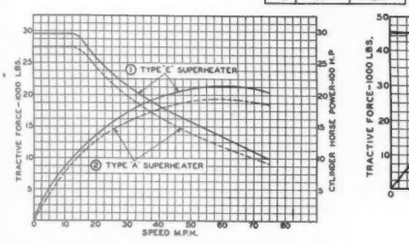


FIG. No. 1

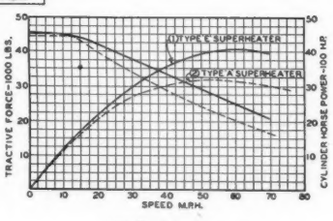


FIG. No. 2

This requires a locomotive delivering highest sustained tractive effort at high speeds, within clearance and weight limits.

The curves illustrate the comparative tractive effort and horsepower capacity of locomotives during actual road tests.

Figure No. 1 indicates the results of a test of identical locomotives, differing only in the type of superheater.

Figure No. 2 shows comparative tests of two locomotives with practically the same boiler diameter and tractive power.

* *

The great improvement shown in tractive effort and sustained horsepower at high speeds with the Elesco Type "E" superheater-equipped locomotive, is typical of Type "E" performance.

ELESCO

A-1353

THE SUPERHEATER COMPANY

Representative of AMERICAN THROTTLE COMPANY, INC.

60 East 42nd Street, NEW YORK 122 S. Michigan Ave., CHICAGO

Canada: THE SUPERHEATER COMPANY, LTD., MONTREAL

Superheaters « Exhaust Steam Injectors « Feedwater Heaters « American Throttles « Pyrometers « Steam Dryers

NEWS

High Locomotive Efficiencies—A Correction

THE statement in the sixth line from the bottom of the first column on page 346 of the September issue is incorrect. It should read: "The only difference between them was that *A* had been in the stock pile longer," not *B*.

No Car Shortage Foreseen by A. A. R.

ASSOCIATION of American Railroads' estimates of the amount of additional freight traffic that the railroads could handle by using the present equipment surplus and repairing bad-order cars and locomotives were increased from 45 to 50 per cent following a meeting on September 8 of the executive committee in Washington, D. C. The 45 per cent figure had been included in a statement issued a few days earlier by A. A. R. President J. J. Pelley who also said that 25 per cent additional traffic could be handled with equipment now owned and in its present condition. While upping his other figure five per cent, as noted above, the executive committee affirmed this 25 per cent estimate of Mr. Pelley.

The A. A. R. press release on the executive committee's follow-up set forth the committee's formal statement in part as follows:

"During the year 1929 the railroads handled approximately eight million more carloads of freight than were handled during the war year of 1918, and did it without car shortage or congestion of any kind.

"The railroads, with equipment now owned and in its present condition, could handle a minimum of 25 per cent more than present business. By putting in serviceable condition the cars and engines now awaiting repair because they are not needed for present business, the railroads could handle 50 per cent more than present business. This volume of traffic would be more than the peak load of the war year of 1918.

"In addition to improved methods of keeping equipment in movement in emergencies, the whole timing of railroad operation has been speeded up since the time of the last general car shortage, now more than fifteen years ago. Freight trains are more than 60 per cent faster, on the average, than they were in 1920, while the average output of transportation for each hour that trains are on the road has been more than doubled in the same period.

"Equipment is constantly wearing out and new equipment is always required. During 1939, more than 10,000 new cars and 139 new locomotives have been placed in service, and there are now on order another 11,000 new cars and 118 new locomotives. As traffic and earnings may increase, such additional equipment as is required and justified can be had in advance of needs.

"But even with present equipment, the speedier movement of trains and better utilization of cars today will enable the railroads to keep ahead of any anticipated demands."

Equipment-Purchasing and Modernization Programs

Canadian National-Canadian Pacific.—Transport Minister Howe of Canada announced recently that the Dominion government will purchase $25,000,000 of new railway equipment, which will then be sold to the Canadian National and the Canadian Pacific and equipment trust certificates or the equivalent taken in return by the government. About $15,000,000 of the new equipment would be for the Canadian National and the rest for the Canadian Pacific. The equipment will consist of some locomotives, and the balance will be box cars and long flat cars.

Chicago, Burlington & Quincy.—The directors of this road have approved an equipment program which includes the purchase of 10 4-8-4 type freight and four Diesel-electric passenger locomotives. The company will also buy or build 100 flat cars.

A heavy repair program scheduled by the Burlington for the balance of 1939 involves 71 locomotives and 4,812 freight cars. So far this year, 106 locomotives and 3,890 freight cars have undergone heavy repairs. In the latter, the construction of 182 new 50-ton box cars is included.

The 71 locomotives to be repaired include nine 2-10-4 Texas type, which will be converted to high-speed freight locomotives by the application of roller bearings to the engine trucks, drivers, tender trucks and valve motion, lightweight rods, reciprocating parts and valves and other improvements; two 4-6-4 Hudson type which will be converted to high-speed passenger locomotives by the application of roller bearings to drivers, trailers and valve motion, lightweight rods and lightweight reciprocating parts and valves and other improvements; and three 4-6-4 Hudson type and three 4-8-4 Mohawk type, which will be improved by the application of lightweight rods, lightweight reciprocating parts and valves.

Chicago, Milwaukee, St. Paul & Pacific.—The federal district court at Chicago has authorized the trustees of the Milwaukee to spend $139,300 to enlarge 398 freight cars to accommodate 1940 model automobiles.

The road will ask the court for permission to spend $10,000,000 for locomotives, freight cars and rails, financing to be done in part by the sale to the Reconstruction Finance Corporation of equipment trust certificates. Ten 4-8-4 type freight locomotives are being purchased from the Baldwin Locomotive Works and 2000 50-ton box cars will be built in company shops. Work on the new box cars will be started upon completion of 1,000 50-ton box cars now being built in its Milwaukee shops.

Chicago, North Shore & Milwaukee.—The C., N. S. & M. has received court approval for the complete modernization of 25 all-steel passenger cars in its own shops at a cost of $89,450. New heating, ventilating and lighting systems and new seats will be installed, before the cars are redecorated.

Delaware, Lackawanna & Western.—The car repair program of the Lackawanna calls for rebuilding 600 coal cars of 50 tons' capacity, at its Keyser Valley shops, Scranton, Pa. Inquiries, as noted elsewhere, are being made for 500 50-ton box cars, 500 50-ton hopper cars, and 100 70-ton gondola cars.

Illinois Central.—The Board of Directors of the Illinois Central has approved the expenditure of $8,000,000 for new equipment and repairs to existing equipment. As a result, an inquiry for freight cars has been revived and the railroad is now inquiring for 750 gondola cars, 750 50-ton hopper cars and 1,000 40-ft. box cars. Inquiries have also been issued for 10 Diesel-electric switching and transfer locomotives for use in the Chicago terminal where they will replace existing steam locomotives.

Missouri Pacific.—The Missouri Pacific's 1939 equipment rehabilitation program, started in August, provides for general repairs to 466 freight cars, including 66 hopper cars of 55-tons capacity, 200 government type gondola cars and 200 gondola cars. The rebuilding of four baggage cars in its own shops has been completed.

New York Central.—The New York Central is planning an equipment-purchasing and modernization program to cost over $10,000,000, according to a recent announcement made by President F. E. Williamson. The purchase of 3,500 steel hopper cars of 55 tons' capacity and 500 box cars, 50 ft. long, noted elsewhere in this issue, are included in the program. Prices are also being asked on material for 500 freight cars of 55 tons' capacity.

Norfolk & Western.—The Norfolk & Western has recently ordered materials for the renewal of bodies of 1,000 hopper cars.

Pennsylvania.—M. W. Clement, president of the Pennsylvania, has announced an extensive program of equipment and property improvement involving an expenditure of almost $17,000,000. The program will include 2,500 new freight cars, 20 new electric locomotives, 3 new streamlined passenger cars, 15 modernized passenger cars, and rail. Repairs to the railroad's freight cars are being undertaken in company shops on a schedule providing for the repair of 17,500 hopper gondolas and box cars.

Since 1929 the company has added more than 27,000 new freight cars to its fleet. The new freight cars in this program will include 2,000 all-steel box cars, 40 ft. long

and 10 ft. high and 500 all-steel automobile box cars, 50 ft. long and 10 ft. high. Of the 40-ft. box cars, 1,000 will be built with single side doors and 1,000 with the double side doors, and all of the automobile cars will have double side doors. The 20 electric locomotives, geared for a speed of 100 m.p.h., will be of the streamlined GG-1 type for service between New York, Philadelphia, Pa., Baltimore, Md., Washington, D. C., and Harrisburg, Pa. The 15 all-steel modernized passenger cars and the 3 new streamlined passenger cars will be used in the de luxe coach service on through trains. Work on the new freight cars, the remodeled passenger cars and on the chassis of the electric locomotive will be carried out at the railroad's Altoona, Pa., shops.

New Equipment Orders and Inquiries Announced Since the Closing of the September Issue

Locomotive Orders

Road	No. of Locos.	Type of Loco.	Builder
Boston & Maine	3	4-8-2	Baldwin Loco. Works
Chicago, Burlington & Quincy	10[1]	4-8-4	Company Shops
Chicago, Milwaukee, St. Paul & Pacific	10	4-8-4 frt.	Baldwin Loco. Works
Detroit, Toledo & Ironton	2	2-8-4	Lima Loco. Works
Erie	3[2]	1,000-hp. Diesel-elec.	Electro-Motive Corp.
	4[2]	600-hp. Diesel-elec.	American Loco. Co.
Louisville & Nashville	1[3]	Diesel-elec.	Electro-Motive Corp.
	1[3]	Diesel-elec.	American Loco. Co.
Norfolk & Western	10	2-8-8-2	Company Shops
Seaboard Air Line	7[4]	2,000-hp. Diesel-elec.	Electro-Motive Corp.

Locomotive Inquiries

Road	No. of Locos.	Type of Loco.	Builder
Canadian Pacific	12	4-6-2	.....
	12	Mikado	.....

Passenger-Car Orders

Road	No. of Cars	Type of Car	Builder
New York, Ontario & Western	2[5]	Rail motor cars	American Car & Fdry. Co.

Passenger-Car Inquiries

Road	No. of Cars	Type of Car	Builder
Canadian Pacific	10	Mail and express	.....

Freight-Car Orders

Road	No. of Cars	Type of Car	Builder
Chesapeake & Ohio	100	Gondola	Greenville Steel Car Co.
	400	Gondola	American Car & Fdry. Co.
	500	Hopper	
	650	Hopper	Pullman-Std. Car Mfg. Co.
	700	Hopper	General American
	150	Hopper	Ralston Steel Car Co.
Chicago & North Western	500	70-ton hopper	Pullman-Std. Car Mfg. Co.
	300	50-ft. box	Mt. Vernon Car Mfg. Co.
Delaware & Hudson	500	50-ton hopper	American Car & Fdry. Co.
	500	50-ton hopper	Bethlehem Steel Co.
Detroit, Toledo & Ironton	25	70-ton covered hopper	American Car & Fdry. Co.
Erie	500	50-ton box	American Car & Fdry. Co.
	200	50-ton box	Pullman-Std. Car Mfg. Co.
	200	50-ton hopper	
	300	50-ton hopper	General American
	250	70-ton gondola	Greenville Steel Car Co.
	50	70-ton flat	Youngstown Steel Car Co.
Illinois Central	750	50-ton gondola	General Amer. Trans. Corp.
	750	50-ton hoppers	Pullman-Std. Car Mfg. Co.
	500	40-ton box	American Car & Fdry. Co.
	500	40-ton box	Mt. Vernon Car Mfg. Co.
New York Central	3,500	Hopper	Despatch Shops, Inc.
	500	Box	Virginia Bridge Co.
Norfolk & Western	1,250	Hopper	Ralston Steel Car Co.
	1,250	Hopper	Bethlehem Steel Co.
	1,000	Hopper	Pullman-Std. Car Mfg. Co.
Tenn. Coal, Iron and Railroad Co.	49	70-ton ore	Company Shops
Union Pacific	2,000[6]	Box	Company Shops
Virginian	1,000	Hopper	Pullman-Std. Car Mfg. Co.
Wheeling & Lake Erie	400	50-ton hopper	Ralston Steel Car Co.
	100	50-ton hopper	
Wisconsin Central	100	Auto box	Pullman-Std. Car Mfg. Co.
	100	Flat	

Freight-Car Inquiries

Road	No. of Cars	Type of Car	Builder
Baltimore & Ohio	1,000	50-ton hoppers	.....
	500	50-ton box	.....
	500	70-ton gondola	.....
Bessemer & Lake Erie	1,000	90-ton hopper	.....
	500	50-ton gondola	.....
	500	50-ton box	.....
Canadian Pacific	1,000	40-ton box	.....
	100	Auto	.....
	200	35-ton refrigerator	.....
Chicago & Illinois Midland	100	70-ton hopper	.....
Chicago Great Western	100	50-ton flat	.....
Chicago, Rock Island & Pacific	500-1,000	50-ton box	.....
Delaware, Lackawanna & Western	500	50-ton box	.....
	500	50-ton hopper	.....
	100	70-ton gondola	.....
Elgin, Joliet & Eastern	500	50-ton gondola	.....
	1,000	50-ton hopper	.....
Louisiana & Arkansas	250-500	50-ton box, 40 ft. 6 in. long	.....
	250-300	50-ton box, 50 ft. 6 in. long	.....
Union Railroad	100	70-ton air dump	.....
Youngstown & Northern	100	70-ton gondola	.....

[1] The building of these locomotives at West Burlington, Iowa, contemplated.
[2] The Erie has asked the federal district court for authority to purchase these locomotives.
[3] Delivery accepted for use in Louisville, Ky., yards.
[4] Order signed by receivership court approving orders placed by receivers. The seven locomotives are in addition to the two ordered from Electro-Motive as noted in the August issue.
[5] Double-end control. Application for permission to purchase this streamline air-conditioned equipment approved by federal court in New Jersey.
[6] To cost approximately $6,000,000. These cars will be of similar design to the 3,400 built in company shops this year. Seven hundred special lightweight automobile cars have also been built in company shops this year. With the construction of the new lightweight cars, the Union Pacific also is initiating a distinctive new color scheme for freight cars. Each of the cars designated for its Challenger merchandising service is painted a battleship gray, the lettering being in bright red.

American Welding Society Meeting

The use of welding on railroads will be featured by the American Welding Society at a session during its twentieth annual meeting to be held at Chicago on October 22 to 27. At the railroad session, beginning at 9:30 a. m., on October 27, three papers will be presented, including one on Maintenance of Way Welding, by C. E. Morgan, superintendent of work equipment of the Chicago, Milwaukee, St. Paul & Pacific, another on Automatic Welding in the Design and Construction of Railroad Rolling Stock by F. C. Hasse, general manager of the Oxweld Railroad Service Company, and a third on Production Spot Welding in the Manufacture of Freight and Passenger Cars, by J. W. Sheffer, assistant engineer of the American Car and Foundry Company.

"Bumping" Interpreted by Retirement Board Counsel

An unemployed individual may not be disqualified from receiving unemployment insurance benefits under Section 4 (a) (ii) of the Railroad Unemployment Insurance Act, as amended, if he fails to "bump" or displace an individual working on a job to which he has seniority rights greater than those of the occupant of the position, according to an opinion recently rendered by the general counsel of the Railroad Retirement Board.

The section of the Act to which the opinion refers provides that there shall not be considered as a day of unemployment for any employee "any of the 30 days beginning with the day with respect to which the Board finds that he failed without good cause, to accept suitable work available on such day and offered to him."

"It is clear," the general counsel points out, "that the disqualification did not apply unless the unemployed individual failed to accept work which was offered to him. Bumping, under seniority rules, does not, in the ordinary case, involve an offer; it involves the exercise of a right." He went on to say that an employee with greater seniority rights may exercise his right under rule of seniority to displace a junior employee, but seniority rules do not make it mandatory upon an unemployed individual with greater seniority rights to displace employees enjoying less years of railroad service. In his opinion, the right to bump is optional with the senior employees, who may exercise his privilege in accordance with his own judgment.

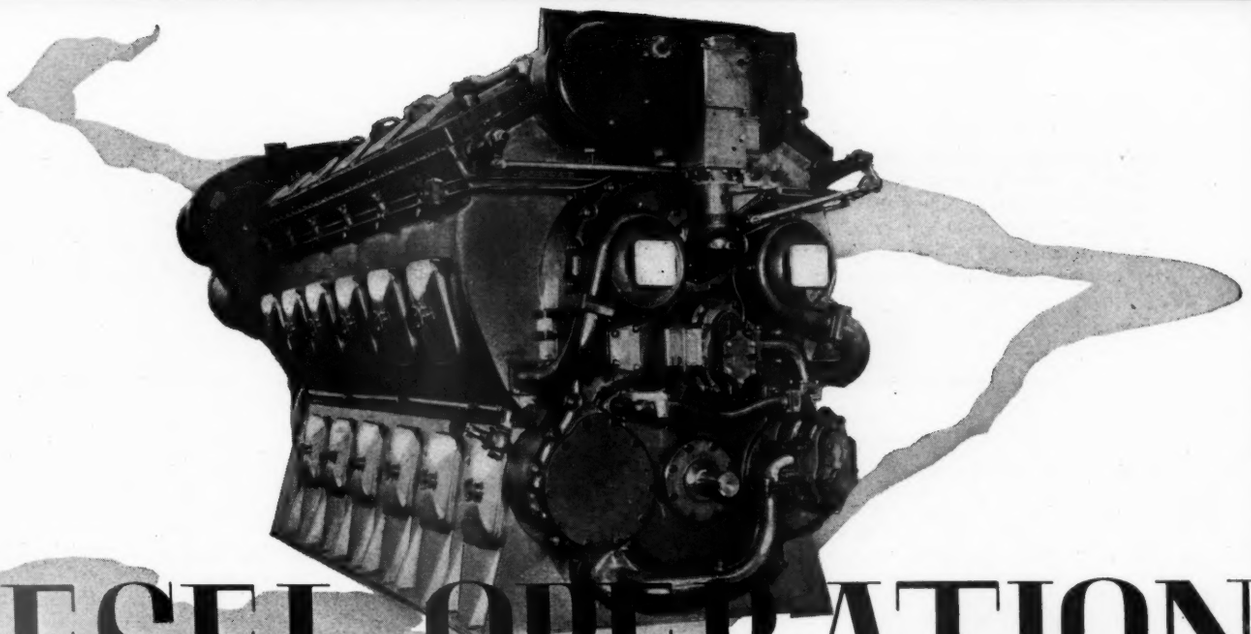
"An interpretation of Section 4 (a) (ii) of the Act which would compel one indi-

(*Turn to second left-hand page*)

30% Increase in Availability —

EMC's HIGH availability average of 95 per cent indicates a more intensive utilization of power with fewer locomotives required to handle switching operations.

GM
GENERAL MOTORS
DIESEL POWER



DIESEL OPERATION

50% Decrease in Operating Expenses

PERFORMANCE records of over 250 EMC Diesel switchers in passenger terminal and yard service with close to two million hours of service on forty-two railroads prove beyond doubt that they are the most profitable motive power investment because they are reducing locomotive costs from 50 per cent to 75 per cent and frequently saving $1000 per month above carrying and amortization charges.

EMC Diesel operation reduces fuel expenses by 75 per cent, maintenance costs 50 per cent, enginehouse expenses 66 per cent, and water costs are eliminated entirely.

Dieselize with EMC and obtain all the benefits of safer, cleaner, quieter, and smokeless operation.

ELECTRO-MOTIVE CORPORATION

SUBSIDIARY OF GENERAL MOTORS LA GRANGE, ILLINOIS, U. S. A.

vidual to displace another or suffer disqualification would result merely in the substitution of one unemployed individual for another," the counsel continues. "Such a result would be in conflict with one of the primary aims of unemployment insurance legislation and of the Act, that is, to stabilize or regularize employment in the industry. Furthermore, to interpret Section 4 (a) (ii) as disqualifying an employee for failure to displace a lower paid employee would tend to increase unemployment among employees in the lower paid brackets. Such a result would be in conflict with the aim of Congress to assist the lower paid employees, who, lacking seniority protection, suffer greater distress in a period of unemployment."

Supply Trade Notes

AVERY C. ADAMS has been elected vice-president in charge of sales and a member of the executive committee and board of directors of the United States Steel Corporation of Delaware with headquarters

Avery C. Adams

at Pittsburgh, Pa. Mr. Adams succeeds C. V. McKaig, who becomes assistant to president, with duties as may be assigned. Mr. McKaig continues as a member of the executive committee and board of directors.

Avery C. Adams was born at Youngstown, Ohio on December 15, 1897. He attended public and private schools and was graduated from Choate in 1917. He served with the United States Navy during the World War and was graduated from Yale University in 1920. Following his university training in metallurgy, he entered the steel industry and was until May, 1928, assistant general manager of sales for the Trumbull Steel Company. He was manager of the sheet and tin plate division of the Republic Steel Corporation in 1928, and later in the same year became sales vice-president and director of the General Fireproofing Company. He first joined the United States Steel subsidiary in June, 1936, as manager of sales, sheet division, Carnegie-Illinois Steel Corporation, resigning in December, 1938, to become vice-president and assistant general manager of sales at Chicago, of the Inland Steel Company. He now returns to the United States Steel organization.

◆

CHARLES L. HUSTON, JR., assistant staff supervisor of employment at the Rolling Mill Company, Middletown, Ohio, has resigned, to become director of personnel of the Lukens Steel Company at Coatesville, Pa.

HOWARD B. BROWN, who has been associated with the Pitcairn Company, has been elected secretary of the Pittsburgh Plate Glass Company, Pittsburgh, Pa., to succeed Carl S. Lamb, deceased.

◆

THOMAS C. GRAY has been appointed chief engineer of the Franklin Railway Supply Company, Inc., New York.

◆

GEORGE E. SCOTT has resigned as purchasing agent of the Missouri-Kansas-Texas to become vice-president and assistant sales manager of the Scullin Steel Company, St. Louis, Mo. Mr. Scott was born at Cleveland, Ohio, on May 27, 1885, and entered railway service in 1901 as a messenger boy on the Lake Shore and Michigan Southern (now a part of the New York Central) at Air Line Junction, Ohio.

George E. Scott

After serving as clerk to the assistant superintendent, secretary to the general superintendent, secretary to the assistant general manager and secretary to the vice-president, he resigned in 1912 to enter the employ of the Missouri-Kansas-Texas as secretary to the president. In the following year, he was promoted to assistant purchasing agent, and, in 1914, was appointed acting purchasing agent. In the same year, he became purchasing agent serving as such until 1918, when he also became purchasing agent of the St. Louis-San Francisco. During federal control, 1919-1920, he was also a member of the Regional Purchasing Commission, Southwestern Region. Since 1920, Mr. Scott has been purchasing agent of the Missouri-Kansas-Texas. He was chairman of the Purchases and Stores division of the Association of American Railroads in 1933, 1934 and 1935.

WILSON H. MORIARTY, sales engineer of the National Malleable & Steel Castings Company, Cleveland, Ohio, has been promoted to sales manager of the Cleveland works. Mr. Moriarty joined the company in 1919, following graduation from Case School of Applied Science and service in the army. He was resident inspector at the East St. Louis, Ill., plant and later at the Chicago and Cleveland plants, subsequently becoming chief inspector for all plants. He has been in the sales department since 1931.

◆

L. T. JOHNSTON, vice-president of the Armco Railroad Sales Company, Middletown, Ohio, has been elected president and general manager, and E. T. Cross, formerly general manager of the Ingot Iron Railway Products Company, whose railroad sales were taken over by the Armco Railroad Sales Company on July 1, has been appointed assistant general manager of the Armco Railroad Sales Company, with headquarters, as before, at Middletown, Ohio.

◆

THE GENERAL STEEL CASTINGS CORPORATION, Eddystone, Pa., has opened a sales office at 310 S. Michigan avenue, Chicago. John A. McCormick, formerly sales engineer, is now district manager in charge of the new office. Frank B. Barclay, sales representative at Granite City, Ill., has been transferred to Chicago to assist Mr. McCormick.

John A. McCormick

Mr. McCormick has been associated with the General Steel Castings Corporation and its predecessor, the Commonwealth Steel Company, since 1916. He served in the engineering department at Granite City until 1930, when he was appointed sales engineer at Eddystone, Pa.

WILLIAM A. ROSS, vice-president and general manager of sales of the Columbia Steel Company, San Francisco, Cal., has been elected president, to succeed Ambrose N. Diehl, who has resigned because of ill health. Mr. Ross has been connected with the steel industry since 1895, when he entered the employ of the Washburn Moen Manufacturing Company as an office boy. In 1899, this company was acquired by the American Steel & Wire Company, and Mr. Ross served the new firm as bill clerk and cashier. In 1911, the west coast holdings of the American Steel & Wire Company became the Pacific Coast department of the United States Steel Products Company, a subsidiary of the United States Steel Corporation, and upon this consolidation Mr. Ross was appointed assistant treasurer and later assistant to the vice-president of the products company. In 1930, the Columbia Steel Corporation was acquired by the United States Steel Corporation. The Pacific Coast department of the United States Steel Products Company was then consolidated with the new enterprise under the name of the Columbia Steel Company, with Mr. Ross serving as vice-president and treasurer. He was appointed vice-president and general manager of sales in 1932.

◆

PEDRO C. MORALES, formerly general superintendent of machinery and motive power of the National Railways of Mexico, has been appointed Mexican representative of Iron & Steel Products, Inc., Chicago, with headquarters at Chopo 24, Mexico, D. F., to succeed L. N. B. Bullock, resigned.

◆

CHARLES E. WEBSTER has been appointed general manager of the Timken Roller Bearing Company, Ltd., Toronto, Ontario, with office at 55 Charles street, West. Mr. Webster has been associated with Timken Canadian activities for 20 years, his duties including the sales of Timken products throughout the Dominion.

B. H. LAWRENCE, chief engineer, has been elected vice-president in charge of engineering, United States Steel Corporation of Delaware, and member of its executive committee and board of directors.

◆

W. J. STEWART, sales representative of the transportation department of the Johns-Manville Sales Corporation, at Philadelphia, Pa., has been transferred to the southeastern territory, with headquarters at Washington, D. C., succeeding W. R. Bush, deceased. Mr. Stewart has been associated with the Johns-Manville Corporation for the past 20 years.

Obituary

CHARLES M. SCHWAB, chairman of the board of the Bethlehem Steel Corporation and who was known as "king of steel" since the opening of the century, died of coronary thrombosis, at the age of 77, on September 18 at his home in New York.

Charles M. Schwab

Mr. Schwab had been in ill health for some time. At 17, having completed his classroom schooling, Mr. Schwab swept out a grocery store in Braddock, Pa., daily and at 19, was chief engineer of the Edgar Thompson Works of the Carnegie chain of steel properties where he had started. He had been given a job as a stake-driver. By studying chemistry in a home laboratory, the young executive pioneered in the early stages of metallurgy as applied to the steel business, while, together with Captain Bill Jones, general plant manager of the Edgar Thompson Works, he introduced labor-saving devices to eliminate the crude process of steel manufacture then existent At 25, Mr. Schwab was superintendent of Andrew Carnegie's Homestead plant, one of the largest steel works in the country. Two years later he succeeded Mr. Jones as general superintendent of the Edgar Thompson Works. In 1892, his jurisdiction was extended to include Homestead, and in 1897, he was appointed president of the entire Carnegie Steel Co., Ltd.

In 1901 the United States Steel Corporation was formed with Mr. Schwab as president. He resigned, however, in 1903 to embark on the ambition of his life—the upbuilding of his own steel enterprise. In 1904 he organized the Bethlehem Steel Corporation. Our entrance into war saw him as director-general of the Emergency Fleet Corporation. After the Armistice, he decided to place Bethlehem in the hands of Eugene Grace (its president since 1916) and experienced associates. Mr. Schwab continued to advise as chairman but held firm to the principle of non-interference until his death.

◆

JOHN FRANKLIN MILLER, until a few months ago vice-chairman of the board of directors of the Westinghouse Air Brake Company and an officer of other industrial organizations, died at Goshen, N. Y., on September 17, at the age of 80 years.

◆

H. H. CUST, who retired as vice-president, secretary and treasurer of the Mount Vernon Car Manufacturing Company in April, 1937, died suddenly on September 7, while on a visit in Dearborn, Mich. He was 80 years old.

Personal Mention

General

ALEJANDRO MAURICE has been appointed assistant general superintendent of locomotives of the National Railways of Mexico, with headquarters at Mexico City, D.F.

JOHN C. STUMP, assistant superintendent of motive power and machinery of the Chicago & North Western at Chicago, has been appointed superintendent of motive power of the Western district, a new position, with jurisdiction over locomotive and car matters on that district. His headquarters remain at Chicago.

THOMAS F. POWERS, assistant superintendent of motive power and machinery of the Chicago & North Western at Chicago, has been appointed superintendent of motive power of the Northern district, a new position, with jurisdiction over locomotives and car matter. His headquarters remain at Chicago.

PEDRO DE LEON, assistant superintendent of the Pacific division of the National Railways of Mexico, has been appointed to fill the re-established position of general superintendent of locomotives, at Mexico City, D. F.

Master Mechanics and Road Foremen

GUY S. BENNETT, road foreman of the New York, Ontario & Western, has been appointed general road foreman and fuel supervisor at Middletown, N. Y.

W. L. HOUGHTON, enginehouse foreman on the New York Central at Linndale, Ohio, has been appointed master mechanic on the New York Central, the Michigan Central, the Indiana Harbor Belt and the Chicago River & Indiana, with headquarters at Chicago, succeeding T. P. Ball transferred.

Car Department

A. S. DE CASTRO, assistant chief inspector of air-brake and car-heating equipment of the Canadian National, has been appointed acting chief inspector of air-brake and car-heating equipment, with headquarters at Montreal, Que.

Shop and Enginehouse

H. E. WHITENER has been appointed superintendent of shops of the Central of New Jersey at Elizabethport, N. J., succeeding C. W. Culver, retired. The position of works manager at Elizabethport has been abolished.

Obituary

CURTISS DAY, general foreman of the Erie at Meadville, Pa., died on July 31.

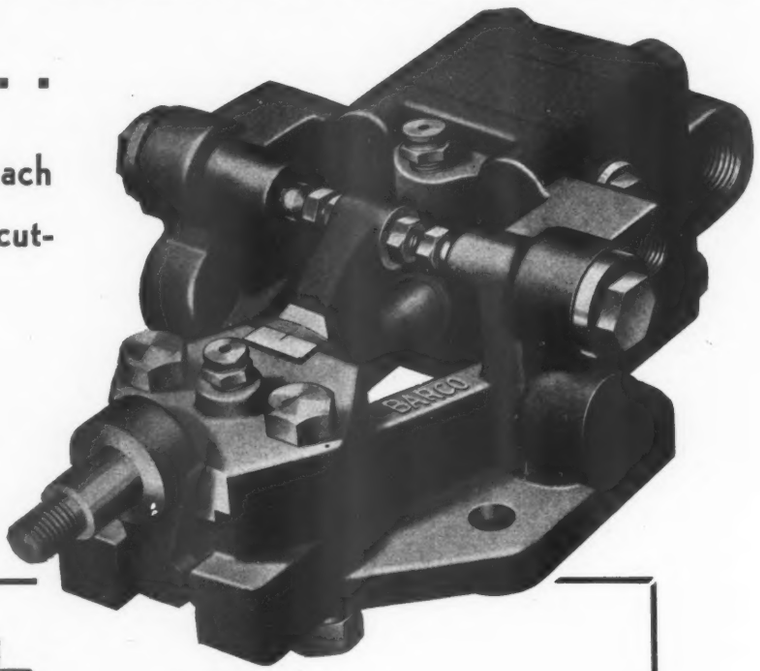
The New BARCO

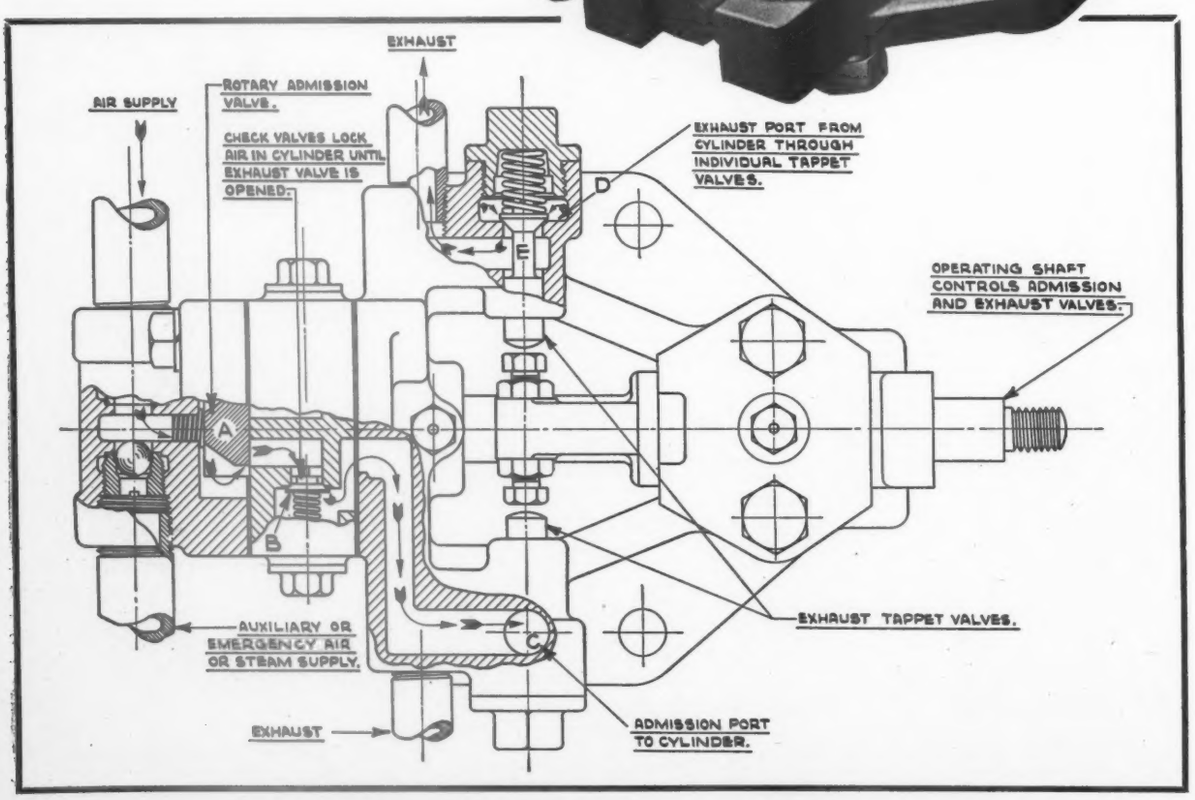
POWER REVERSE GEAR OPERATING VALVE

. . . TYPE M-3 . . .

Same total pressure insured on each side of piston head — maintains cut-off accurately.

Cut-off position maintained even with broken air supply pipe.





Applicable to all types of power reverse gears. Proven by 600,000 miles in high speed passenger service.

BARCO MANUFACTURING COMPANY
1811 W. Winnemac Ave. Chicago, Illinois

In Canada:
THE HOLDEN COMPANY, LTD.
Montreal — Moncton — Toronto — Winnipeg — Vancouver